THE IRON TRADE REVIEW

Volume XLIII CLEVELAND, DECEMBER 31, 1908 Number 27

QUIET WEEK

MARKS THE CLOSE OF THE UNSATISFACTORY YEAR,

But Buying Movement Expected Before Many Weeks—Pig Iron Firm, Few Sales Reported.

The old year closes with the markets in pig iron and finished products very quiet, but there is no evidence of weakness, and there is an almost universal belief that business will improve before many weeks have passed. The taking of inventories has undoubtedly postponed the placing of considerable business, and holiday distractions have also been a factor of the dullness.

Iron Ore on Docks

Iron ore on docks at the close of navigation amounted to 8,441,553 tons, the largest tonnage on record. The receipts at Lake Erie ports for the season were 20,414,491 tons, against 35,195,758 tons for the season of 1907. Eastern furnace interests have contracted for 100,000 tons of Russian ore.

Pig Iron Conditions

A steel interest in the Pittsburg district is sounding the market for its second quarter requirements of basic, and sales of the week included 3,000 tons of basic at St. Louis and the same tonnage at Philadelphia. Foundry grades have been very quiet, the only large sale reported being 8,000 tons to the Standard Sanitary Mfg. Co. for second quarter, at $13 Birmingham. The market is strong, and considerable buying is expected before Feb. 1.

Structural Material

Contracts for structural material for the week were not large, amounting to about 10,000 tons, of which the principal tonnages were 3,000 for the Hart, Shaffner & Marx building at Chicago, taken by the American Bridge Co.; 3,000 tons for the Crane-Best Co. plant near Pittsburg; and 1,300 tons for the Terminal Warehouse Co. building at Baltimore. The Crane Co. warehouse at Chicago will require 2,500 tons.

Railroad Buying

The Baltimore & Ohio is negotiating for a large quantity of spikes, and some orders for track fastenings have been placed. The purchases of 35 Pacific type locomotives from the American Locomotive Co. by the Chicago, Rock Island & Pacific, and five locomotives from the Baldwin Locomotive Works by the Chicago, Cincinnati & Louisville railroads are announced. During the year 15,132 all-steel freight cars, 19,953 steel underframe freight cars, and 1,207 locomotives were ordered.

Bars, Sheets and Pipe

Specifications on bars at Chicago have come in in satisfactory volume, the tonnage for the month received by the leading interest being 18,000. There is more general contracting for sheets, and some mills are still shading prices. The outlook for tin plate is very encouraging. The merchant pipe business during the year has been very satisfactory compared with other iron and steel products. The city of Chicago is in the market for 5,500 tons of cast iron pipe, and Indianapolis for 1,500 tons.

Coke and Old Material

Recent rains have made it possible for many coke ovens to resume, including the Ellsworth plant of the Lackawanna Steel Co., having 500 ovens. Nearly all furnaces in blast, or intending to blow in shortly, have contracted for their first half requirements, and the demand is not active. The old material market is dull, as buyers generally are of the opinion that prevailing prices are too high, and sellers are not disposed to make concessions.

UNITED STATES STEEL CORPORATION VICE PRESIDENTS.

(Special Telegram).

New York, Dec. 30.—W. B. Dickson, second vice president, has been elected first vice president of the United States Steel Corporation to succeed James Gayley. D. G. Kerr, ore agent of the Carnegie Steel Co., Pittsburg, has been elected second vice president to succeed Mr. Dickson.

LARGE DEAL IN COAL LANDS.

Another large transaction in the coal lands of Greene county, Pa., has been closed in Pittsburg, John W. Boileau being the nominal purchaser for associated interests of 6,000 acres for a consideration approximating $1,500,000. The tract purchased is known as the North Waynesburg field, and was acquired from more than 30 holders through trustees. The sale, it is said, leaves practically all the desirable high grade coal in eastern Greene county in few hands, J. V. Thompson, of Uniontown, and associates being the principal holders. This fuel possesses coking properties and extensive oven operations upon it are expected in the next several years. Aside from Mr. Thompson, the present owners of a large portion of the coal land in this territory, most of it being in eastern Greene county, are as follows: Pittsburg-Buffalo Co., John H. Jones, president, 12,500 acres; Pittsburg & Westmoreland Coal Co., 10,500 acres; Emerald Coal Co., 11,000 acres; Bessemer Coke Co., three tracts aggregating 2,000 acres; Monongahela River Consolidated, 3,000 acres; Frank M. Osborne, John G. Paterson and others, 10,500 acres; Youngstown Sheet & Tube Co., Jas. A. Campbell, 1,200 acres; Andrews & Hitchcock Iron Co., of Youngstown, Frank M. Hitchcock, president, 1,000 acres; W. A. Stone, et al., 1,200 acres; H. C. Frick Coke Co., 2,500 acres; Charles McKnight and Alex Laughlin, of Pittsburg, whose purchase of 1,500 acres has just been announced.

LOWER PIG IRON PRICES.

Pittsburg, Dec. 30.—A sale of 600 tons of Bessemer for second quarter has been made at $16.50 valley. There is freer offering of foundry iron at $15.50 valley. The rebuilt Scottdale furnace will be blown in Jan. 4.

THE WEEK IN IRON CENTERS

PITTSBURG.

More Liberal Buying Expected at a Not Far Distant Date.

Office of THE IRON TRADE REVIEW,
510 Park Bldg., Dec. 29.

Quietly and with confidence greatly renewed, the iron and steel industry is moving into the new year and into a period of improved promise. The main evidence of underlying disturbance is now presented by the uncertainty over the likely revision of the tariff on iron and steel material, but beyond this prominent factor the atmosphere is clear and sentiment is ruling strongly hopeful.

It is believed there are logical reasons for the spring season upon which the eyes of makers is now fixed to show a substantial improvement in business. Stocks in the country have been reduced by degrees in the passing year to the minimum point and any surplus of material that was on hand at the start of the depression has been absorbed, leaving the way of future trade clear and unimpeded. With the better prospects for greater consumption in general and with the rise of a stronger confidence among buyers, a partial reestablishment at least, of stocks at the spring season is looked upon as reasonably assured. Though caution is still manifested in negotiations dealing with the future, jobbers in all lines are now holding out to manufacturers the expectation that they will come more freely into the market within a short time.

The closing month of the year has been light in tonnage booked by reason of the normal influence of the holiday period and of inventory taking. Despite the season, the volume of current orders coming to some large makers, is encouraging and in some instances 65 per cent of a normal weekly aggregate of specifications has been reached.

Pig Iron.—The market in its present state of extreme quietness is leaving its settled price limits not clearly defined, but it is evident that the inclination is towards firmness. The true level of current trade is not expected to be set before a buying movement of some consequence is inaugurated.

A favorable feature in foundry iron is the number of inquiries for material coming from small melters. These aggregate little tonnage, but are accepted as indicating greater demands upon the small consumers by the larger plants. Sales are few and prices range from $15.50 to $16 valley.

A steel interest in this district is sounding the market for its second quarter requirements of basic and other melters are keeping closely in touch with the situation. A small lot of prompt basic sold at $15.75 valley which is about the general market level in this grade. In Bessemer a local steel foundry is inquiring for 600 tons for second quarter. Carload sales are being made at $17 valley. A small lot of malleable was taken at a shade under $16 valley. The market is quoted at $15.90 to $16.40 valley.

One of the large southern makers is now asking $13.50 Birmingham for No. 2 for second quarter delivery.

The Shenango Furnace Co. will blow out its No. 3 stack about Jan. 10, for rebuilding.

On prompt and first quarter shipment on northern iron, we quote as follows:

Bessemer, valley	$16.50 to 17.00
Bessemer, Pittsburg	17.40 to 17.90
No. 1 foundry, Pittsburg	16.90 to 17.40
No. 2 foundry, Pittsburg	16.25 to 16.90
Gray forge, Pittsburg	15.40 to 15.90
Basic, valley	15.75 to 16.00
Basic, Pittsburg	16.65 to 16.90

Ferro-Alloys.—An increased demand for the lower grades of ferro-silicon is noted. The imported material is now meeting the competition of the domestic. There is some negotiation for ferro-manganese, mainly in small lots, and prices are firm. We quote 80 per cent ferro-manganese at $44.50 to $45.50 seaboard, with a freight rate of $1.95 to Pittsburg, the lower quotation applying to prompt delivery.

Imported 50 per cent ferro-silicon is quoted $63.50 to $64 Pittsburg on forward deliveries; domestic 12 per cent, $27.50; 11 per cent, $26.50; 10 per cent, $25.50 Pittsburg.

Sheets.—There is a more general disposition of consumers to contract for their requirements for six months ahead, and the prospects of the mills for spring activity are improving. Some mills are shading sheet prices from $1 to $2 a ton. The operations of the largest interest this week are considerably reduced, owing to the idleness of the Kiskimenitas valley plants. Official prices are as follows:

Blue annealed sheets, No. 10 and heavier, 1.80c; Nos. 11 and 12, 1.85c; Nos. 13 and 14, 1.90c; Nos. 15 and 16, 2c; box annealed, Nos. 17 to 21, 2.25c; Nos. 22 to 24, 2.30c; Nos. 25 and 26, 2.35c; No. 27, 2.40c; No. 28, 2.40c; No. 29, 2.60c; No. 30, 2.70c; galvanized sheets, Nos. 10 and 11, 2.45c; Nos. 12 and 14, 2.55c; Nos. 15 and 16, 2.65c; Nos. 17 to 21, 2.80c; Nos. 22 and 24, 2.95c; Nos. 25 and 26, 3.15c; No. 27, 3.35c; No. 28, 3.55c; No. 29, 3.70c; No. 30, 2.95c; corrugated roofing, $1.75 per square for No. 28 painted, 2½-inch corrugation, and $3.10 per square on galvanized roofing, 2½-inch corrugation, No. 28.

Jobbers are allowed $1 a ton from these prices.

Tin Plate.—The outlook in tin plate is reported as excellent, and makers are anticipating a practically normal winter and spring business. There is a good contracting volume, and the canners are now closing for their requirements for the early fruit crop. Mill operations are better. The American Sheet & Tin Plate Co. this week has 53 per cent of capacity active, its Laughlin works of 23 mills having resumed, against 44 per cent the preceding week. We quote official prices:

Coke tin plate, 100-pound basis, 14 x 20, $3.70 f. o. b. mill Pittsburg district. Terms, 30 days, less 2 per cent for cash in 10 days.

Plates.—Current bookings are not heavy and the market is quiet. The Carnegie Steel Co. will roll 5,000 tons of plates required for the additional order of 500 steel cars placed with the Standard Steel Car Co. by the Pittsburg & Lake Erie railroad. A riveted pipe line at Spokane, Wash., is now before the market, and will require about 700 tons. Shading in plate prices continues. We quote official prices:

Tank plate, ¼-inch thick, 6¼ to 100 inches, 1.60c f. o. b. mill Pittsburg. Extras are as follows per 100 pounds: Boiler and flange steel plates, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½-inch to and including 3/16-inch plate on thin edges, 0.10c; under 3/16 to and including No. 8, 0.15c; under No. 8 and including No. 9, 0.25c. Five cents

extra for less than carloads. Terms, net cash in 30 days.

Rails and Track Material.—Outside of the Pennsylvania, none of the large steam lines which obtain their tonnage from the mills in this district, has placed contracts. The Pennsylvania allotment has not yet reached the mills. Traction companies continue to buy steadily in small lots, one order of the week being for about 500 tons. Light rail bookings are holding up splendidly and are averaging about 1,500 tons weekly with the local maker, which is closely approaching the normal output. Re-rollers are shading prices of billets and rails. At the Edgar Thomson works, No. 1, the large standard mill is going, as well as No. 3, the light rail mill. Their percentage of activity is better. The Baltimore & Ohio is negotiating for a large lot of spikes. On present specifications on Bessemer rails, we quote as follows, the base price for open-hearth rails being $30 mill:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; 8-pound, $32; 12-pound, $29; 16-pound, $27; 20-pound, $26; 25 to 45-pound, $25; angle splice bars for standard sections, $1.65; standard spikes, $1.70 to $1.80 Pittsburg; hand spikes, $1.80 to $1.90 Pittsburg.

Steel.—The movement in sheet bars is better, and the consumption of billets is also holding at an improved gait. Inquiries on new business are few, most users being under contract.

Bessemer and open-hearth billets, base sizes, are quoted at $25 Pittsburg, and forging billets at $27 Pittsburg, subject to the division of the freight charge over $1 and not exceeding $3, and sheet and tin bars at $27.50 Pittsburg, valley and Wheeling territory, and $27 Pittsburg for delivery to other points.

Hoops and Bands.—Hoop prices are firmer and there is less evidence of concessions being made by makers. This buying movement of consumers for their new year has not yet started. We quote official prices:

Hoops in carload lots, 1.80c; in less than carload lots, 1.90c; bands, 1.40c, base half extras as per standard steel.

Merchant bars.—After having been idle for about a year, the Alabama works at Gate City, Ala., of the Republic Iron & Steel Co., will resume operations about Jan. 15. The 23 puddling furnaces and the finishing mills will be started for the production of bar iron. With this plant active, the Republic company will have in operation all of its 10 works with the exception of its Birmingham and Toledo mills. Merchant bars, both iron and steel, are moving quietly, but with a firmer tone as respects prices. Bar iron makers particularly, are gradually stiffening in their ideas. Shafting is holding fairly firm at prevailing quotations. We quote officially as follows:

Common iron bars, 1.50c Pittsburg in carload lots and over; 1.55c in less than carloads; 1.35c to 1.40c base Pittsburg, plus freight to point of shipment on western deliveries; Bessemer and open-hearth steel bars, 1.40c; plow and cultivator, 1.40c; channels, angles, zees, tees, under three inch, 1.50c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size, 0.30c advance. Cold rolled and ground shafting, 57 per cent in carloads, and 52 per cent in less than carloads, delivered in base territory; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flats, 1.60c to 1.65c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.10c to 2.15c. Planished and machine straightened tire steel is 1.60c base. Iron finished tire under 1½ by ½ inches, 1.55c, plus ½ extra on tire card; iron finished tire, 1½ by ½ and over, 1.40c; plus ½ extra on the steel bar card.

On cold rolled strip steel, width 1½ inches and wider, and 0.100 inch and thicker, we quote base prices for 100 pounds, $3.35 on hard, and $3.60 on soft.

Structural Material.—The inquiry for structural material is better, and much work is now under estimate which will likely be brought out at the spring season. The shape mills are getting a fair run of orders. The low price condition among fabricators has not improved. The general contract for the new plant of the Crane-Best Co., at Oakmont, Pa., has been taken by H. L. Kreusler, who will also erect the steel work, about 3,000 tons. The contract for the material and fabrication has not been awarded, but this will likely go to the American Bridge Co. The First German Evangelican Protestant church of Pittsburg has, in a tentative stage, plans for a large 14-story combination church and commercial building which, if carried out, would require about 10,000 tons. We quote official prices as follows:

Beams and channels, 15-inch and under, 1.60c; over 15 inches, 1.70c; zees, 1.60c; tees, 1.65c; angles from 3 to 6 inches, 1.60c; over 6 inches, 1.70c; universal and sheared plates, 6¼ inches and wider, 1.60c base.

Merchant Pipe.—The pipe consumption in the country in 1908 has exceeded the expectation of manufacturers, and a period of quite satisfactory trade, as compared to other iron and steel products, has been passed. The general condition of the market is one of quietness, particularly as to the merchant trade, owing to the season and inventory activities. The tone is firm and prices are well maintained. In oil and gas field goods, the projects calling for 80 miles of 16-inch and 30 miles of 6 and 8-inch, which have been in sight for some time, are the principal prospects. We quote the following official base discounts subject to five off to jobbers:

	—Steel—		—Iron—	
	Black.	Galv.	Black.	Galv.
¼ to 6 inches....	75	65	73	63

Boiler Tubes.—The market is still holding quiet without any special features. We quote the following official base discounts to the general trade on base sizes:

BOILER TUBES.

	Iron.	Steel.
2¼ to 5 inches.....	52	65

Wire Products.—While a moderate business in wire fencing, plain wire and other products is moving, the general disposition of manufacturers is to look to the spring to record substantial improvements, principally from the jobbing trade. The present period falling between seasons is holding conditions within bounds, but prospects for the future are good. We quote official prices as follows:

Wire nails, jobbers' carload lots, $1.95; retailers' carload lots, $2; painted barb wire, jobbers' carload lots, $2.10; retailers' carload lots, $2.15, with 30c for galvanizing; plain wire to jobbers in carloads, 1.80c; and to retailers in carloads, 1.85c.

Wire Rods.—Some inquiry continues in the market, but buyers in this territory are well covered. We quote $33 Pittsburg on Bessemer and $34 Pittsburg on open-hearth rods.

Coke.—Fuller oven operations are the rule at present, owing to the disappearance of the water famine in the different western Pennsylvania coke regions. One of the notable resumptions is that of the Ellsworth plant of the Lackawanna Steel Co. of 500 ovens in Washington county. Selling is light. The estimate is made that 90 per cent of the furnaces now in blast, or those intending to blow in shortly, are under contract for their first-half requirements. Spot furnace coke is more plentiful, but prices are reasonably firm at $1.70 to $1.80 ovens, with

contract at $1.90 to $2.00 ovens. We quote standard Connellsville foundry coke at from $2.15 to $2.25 ovens, and on contract from $2.25 to $2.50 ovens. For the week ending Dec. 19, the *Courier* reports capacity in blast of 22,061 ovens and 15,795 idle, with a production of 251,903 tons, compared with 21,333 ovens active, 16,520 ovens inactive, and an output of 244,309 tons the preceding week, which up to that time was the heaviest weekly output of the entire year 1908.

Old Material.—A disposition to postpone the buying of their own scrap requirements until they have disposed of those grades which they are accustomed to sell to the dealers at this period of the year is shown by the mill producers of old material. These contracts cover the unused portion of the scrap output of the mills over the first quarter and first half. A sheet and tin plate interest selling to a dealer realized $15 at its works in this district for its bundled sheet scrap. At the usual differential, this price would put heavy melting stock in excess of $18, where $17 this district is the top of the market today. The general market is not active and small sales predominate. As stated in our Philadelphia market report last week, a large eastern Pennsylvania steel works has taken 25,000 tons of heavy steel. We quote gross tons, delivered in the Pittsburg district, as follows:

Heavy melting scrap, $16.25 to $16.75; re-rolling rails, $17.25 to $17.75; bundled sheet scrap, $14.50 to $15.00; iron axles, $23.50 to $24; old iron rails, $18.50 to $19; No. 1 wrought scrap, $17.25 to $17.75; old car wheels, $16.25 to $16.75; low phosphorus, $18.50 to $19; machine shop turnings, $12.75 to $13.25; cast borings, $11 to $11.50; No. 1 cast scrap, $14.25 to $14.75; malleable, $14.50 to $15.

CHICAGO.

Extreme Quiet Prevails—Car Orders for the Year.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, Dec. 29.

The holiday week in Chicago has been one of exceeding quiet from the standpoint of transactions in the iron and steel market. Mill operations were curtailed and offices were vacated. Some little billet business was reported and likewise a fair demand for merchant steel and sheets. Interest in contracting for bar iron has not gone beyond the inquiry stage as yet. Specifications on steel bar contracts did not fall off appreciably during the week. Plate tonnage is very light and nothing of interest developed with regard to rails. The inquiry for light rails and traction sections is very good. The largest structural contract in immediate prospect, to be announced last week, is 2,500 tons for a new warehouse for Crane Co. in Chicago. Both pig iron and old material were featureless issues in the market. The purchase of 35 Pacific type locomotives from the American Locomotive Co. by the Chicago, Rock Island & Pacific is reported; also five locomotives from the Baldwin Locomotive Works by the Chicago, Cincinnati & Louisville railroad. Figures covering the railroad equipment purchased by all the railroads throughout the year show that 15,132 all-steel freight cars were ordered, 19,953 steel-underframe freight cars and 1,207 locomotives.

Pig Iron.—Although several inquiries involving a fair tonnage are still pending in this market there is apparently an entire absence of inclination to close contracts promptly. One southern interest reports sales of 600 tons during the week, which is as large a tonnage as was handled by anyone. At present the price of iron here, which is very firm, is supported by the buying of iron elsewhere. It is understood that the poorer grades of iron have been purchased so freely by pipe makers and others that this quality is quite scarce. There have been no recent changes in prices and we quote as follows:

Lake Superior charcoal	$19.50
Northern foundry No. 1	18.00 to 18.50
Northern foundry No. 2	17.50 to 18.00
Northern foundry No. 3	17.00 to 17.50
Southern foundry No. 1	17.85 to 18.35
Southern foundry No. 2	17.35 to 17.85
Southern foundry No. 3	16.85 to 17.35
Southern foundry No. 4	16.35 to 16.85
Southern No. 1 soft	17.85 to 18.35
Southern No. 2 soft	17.35 to 17.85
Southern gray forge	15.60 to 16.10
Southern mottled	15.35 to 15.60
Southern silveries, 4 per cent silicon	18.10 to 18.60
Southern silveries, 5 per cent silicon	18.35 to 18.85
Southern silveries, 6 per cent silicon	18.85 to 19.35
Jackson Co. silveries, 6 per cent.	19.90
Jackson Co. silveries, 8 per cent.	20.40 to 20.90
Jackson Co. silveries, 10 per cent.	21.90
Malleable Bessemer	17.00 to 17.50
Standard Bessemer	17.65 to 18.15
Alabama Basic	17.35 to 17.85

Billets and Rods.—The inquiry for small lots of forging billets is fairly active and a number of sales of this character are reported. The total tonnage, however, is moderate. Prices are firm and in this territory only full schedule prices are quoted. We quote as follows: 4 x 4-inch rolling billets, $26.50, and forging billets, $28.50, base Chicago.

Merchant Steel.—For some of the local interests, the demand for merchant steel composed of agricultural shapes and carriage makers' steel constituted the major portion of last week's business. A serious interest is displayed on the part of certain railroad and other consumers regarding their requirements of bar iron through the first six months and through the entire year. The most prominent inquiry of this character, that of the Illinois Central railroad, has not brought out a very large list of bidders, largely because deliveries are specified extending over the entire year. The lack of interest among the mills may result in the placing of this business on an exchange contract basis. During the past week, the operations of the mills were considerably curtailed. The Interstate Iron & Steel Co. mill lost only the last two days of last week, but the Tudor and Inland mills of the Republic Iron & Steel Co. were shut down all week. All of these plants resumed on Monday. Steel bar specifications did not fall off materially during the holiday week. During the month, the leading interest has received 18,000 tons on specifications. The Moline mill has been running continuously. We quote as follows:

Bar iron, 1.50c to 1.53c; soft steel bars and bands, 1.58c, half extras; soft steel angles, less than 3 x 3, 1.68c; hoops, 1.98c base, full extras; planished or smooth-finished tire steel, 1.78c; iron finish, up to 1½ x ½-inch, 1.73c base tire card; iron finish, 1½ x ½-inch and larger, 1.58c base steel card; channel for solid rubber tire, ¾ to 1 inch, 2.08c; and 1⅛ inch and larger, 1.98c; smooth-finished machinery steel, 1.83c; flat sleigh shoe, 1.63c; concave and convex sleigh shoe, 1.83c; cutter shoe, 2.95c; toe calk steel, 2.13c; railway spring, 1.93c base steel card; vehicle spring steel, 1.98c base vehicle card; crucible tool steel, 7c to 9c, with higher prices asked on special grades. Quotations on shafting are 56 per cent off the list for carload lots, and 52 per cent off for less than carload lots, carload freight allowed to points in base territory. On iron and steel bars from local stocks, we quote as follows: Bar iron, 1.90c to 2c, full extras; soft steel bars, 1.80c per 100 pounds base, plus half extras; soft steel hoops, 2.30c, full extras.

Plates.—The western demand for plates is confined to inquiry for small quantities for miscellaneous purposes. This business is scattering and is not sufficient to contribute any degree of firmness to prices. We quote as follows:

Plates, ¼-inch and heavier, 6¼ to 100 inches wide, either universal or sheared, 1.78c Chicago. For ex-

tras see Pittsburg report. Jobbers' prices for shipment from local stocks are as follows: Tank steel, ¼-inch and heavier, up to 72 inches wide, 2c to 2.10c; from 72 to 96 inches wide, 2.10c to 2.20c; 3-16-inch up to and including 60 inches wide, 2.10c to 2.15c; 72 inches wide, 2.35c to 2.45c; No. 8, up to 60 inches wide, 2.10c to 3.15c. Flange and head quality, 25c extra.

Sheets.—The sheet business has been quite fair during a quiet week, although the jobbers have not resumed again their buying for stocks. The lighter gages continue to be most in demand. Trade from store is moderately good, but the general volume of business is not more than can be easily accommodated. Prices apparently are very well maintained and we quote as follows:

No. 10, 2.15c to 2.25c; No. 12, 2.20c to 2.30c; No. 14, 2.25c to 2.35c; No. 16, 2.35c to 2.45c; Nos. 18-20, 2.60c to 2.65c; Nos. 22-24, 2.65c to 2.70c; No. 26, 2.70c to 2.75c; No. 27, 2.75c to 2.80c; No. 28, 2.85c to 2.95c; No. 30, 3.25c. Galvanized sheets, No. 10 to 16, 3.05c to 3.10c; Nos. 18 to 20, 3.15c to 3.25c; Nos. 22 to 24, 3.30c to 3.35c; No. 26, 3.50c to 3.55c; No. 27, 3.70c to 3.75c; No. 28, 3.90c to 4.00c; No. 30, 4.40c to 4.50c.

Structural Steel.—The announcement of the letting of the contract for the steel for the new Chicago city hall last week to the American Bridge Co., while premature as to the actual closing of the transaction, is correct to the extent that the American Bridge Co. will undoubtedly furnish the steel. The fabricating contract for the Hart, Schaffner, Marx building, covering about 3,000 tons, has been virtually awarded to the same interest also. Figures are being received on 2,500 tons for a warehouse to be erected in Chicago by the Crane Co. It is understood that Bethlehem shapes are specified. The Chicago, Milwaukee & St. Paul has an inquiry out for about 300 tons of bridge structurals. The prospective tonnage is rather uncertain and of no great amount. It is expected that the Northern Pacific requirements, amounting to about 8,000 tons, will be covered in January. The Vendome hotel is also looked upon as a January prospect, but this proposition is in a very indefinite state and it may be a considerable time before anything is done with it. Prices for fabricated steel have not greatly improved and within the week some very low bids have been made. We quote as follows:

Beams and channels, 3 to 15 inches, inclusive, 1.78c to 1.81c, delivered Chicago. For extras see Pittsburg report. Quotations from store are as follows for carload lots and over:

All angles, 3 inches and larger, including 6 inches, $1.95 per 100 pounds; angles over 6 inches, $2.05 per 100 pounds, base; beams, 3 to 15 inches, inclusive, $1.95 per 100 pounds, base; channels, 3 inches and larger, $1.95 per 100 pounds, base. Less than carload lots are $1 a ton higher than foregoing prices.

Rails and Track Supplies.—The general inquiry for rails is good, but orders are few. Extensions of traction projects are again taking on life and several inquiries for rails from such sources have been received. One order for 900 tons of traction rails was placed with the leading interest and another inquiry for 300 tons of 45-pound sections was reported. The sales of light rails for the month to date aggregate 5,000 tons. The month's sales of spikes total 113,000 kegs, and of bolts 65,000 kegs. The bolt works of the leading interest are 10 days behind their orders. The railroad buying in this territory is not considered to have been begun as yet. We quote mill prices for Chicago delivery as follows:

Standard Bessemer rails, $28; open-hearth, $30, f. o. b. mill in 500-ton lots and over; less than 500 tons, $2 extra, full freight to destination; light rails, 25-pound to 45-pound, $26; 20-pound, $27; 16-pound, $28; 12-pound, $29. Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; spikes, 1.80c to 1.90c; track bolts, with square nuts, 2.15c to 2.25c; with hexagon nuts, 2.30c to 2.40c. Small railroad and square boat spikes, 1.90c base, f. o. b. Chicago.

Merchant Pipe and Boiler Tubes.—With the exception of a moderate and fairly satisfactory demand for locomotive boiler tubes, the general demand for tubular goods is very quiet. We quote mill discounts as follows:

	—Steel— Black.	Galv.
¾ to 6 inches, inclusive.....	73.2	63.2
7 to 12 inches, inclusive.....	70.2	55.2

BOILER TUBES.

	Steel.	Iron.	Seamless.
2¼ to 5 inches, inclusive..	63.2	50.2	50.2

Cast Iron Pipe.—The city of Chicago is in the market for 5,500 tons of small pipe for which bids are to be received this week. The city of Indianapolis, which rejected all bids on a letting of 1,500 tons recently, has readvertised, the letting to be held Jan. 8. It is understood that the 13,000 tons of pipe for which the city of Detroit was in the market and in connection with which all bids were twice rejected, has been given to the Detroit shop of the American Car & Foundry Co. There are no changes in prices and we quote as follows: 4-inch pipe, $27; 6 to 16-inch, $26; larger sizes, $25; gas pipe, $1 a ton higher.

Wire Products.—The holiday season has produced a noticeable slump in the movement of wire products which will continue until the salesmen again return to the road on Jan. 4. It is expected that the summaries for the year will show that 1908 shipments were only from 15 to 20 per cent behind those of 1907. We quote as follows:

Wire nails, jobbers' carload lots, $1.95; retailers' carload lots, $2; painted barb wire, jobbers' carload lots, $2.10; retailers' carload lots, $2.15, with 30c for galvanizing; plain wire to jobbers in carloads, 1.80c; and to retailers in carloads, 1.85c. Wire rods, Bessemer, $33; open-hearth, $34; chain rods, $33, f. o. b. Pittsburg.

Old Material.—A sale of 500 tons of re-rolling rails to a consumer at a delivered price of $16.75 with a 25-cent freight from Chicago was about the only transaction reported for the week. No one wished to buy in the absence of any railroad offerings during the week and apparently no one wished to sell as a matter of choice. There is some inquiry for No. 1 wrought and for shafting and these two items are the only ones to show indications of strength. The quantity of scrap which has been accumulated in Chicago should not be overestimated. It is probable that at no time was there more than 250,000 tons stored in this city and vicinity and it may be safely said that not more than 200,000 tons is being held.

Old car wheels	$15.25 to 15.75
Old iron rails	19.75 to 20.25
Re-rolling rails (4 ft. and over).	16.50 to 17.00
Old steel rails (4 ft. and under)	15.00 to 15.50
Light section relayers, 45 lbs. and under, subject to inspection....	21.00 to 23.00
Relaying rails, subject to inspection	19.00 to 19.50
Frogs, switches and guards.....	14.50 to 15.00
Heavy melting steel	14.50 to 15.00

We quote, net tons, as follows:

No. 1 R. R. wrought.....	$14.25 to 14.75
No. 2 R. R. wrought.....	13.25 to 13.75
Knuckles, couplers and springs..	14.00 to 14.50
Shafting	16.75 to 17.25
Iron car axles	20.75 to 21.25
Steel car axles	18.50 to 19.00
Dealers' forge No. 1.....	11.00 to 11.50
Pipes and flues	11.00 to 11.50
No. 1 cast, 150 lbs. and less....	13.75 to 14.25
No. 1 mill	9.00 to 9.50
Mixed busheling (Nos. 1 and 2).	9.25
Country sheet	5.50 to 6.00

No. 1 boiler cut	10.50 to 11.00
Boiler punchings	12.50 to 13.00
Cast borings	7.25 to 7.75
Mixed borings, etc.	7.25 to 7.75
Machine shop turnings	8.75 to 9.25
Railroad malleable	13.50 to 14.00
Agricultural malleable	11.50 to 12.00
Stove plate and light cast scrap	12.00 to 12.50
Old iron splice bars	17.00 to 17.50

CLEVELAND.

Large Amount of Ore on Docks—Pig Iron Very Quiet.

Office of THE IRON TRADE REVIEW,
Browning Building, Dec. 29.

Iron Ore.—Ore on docks Dec. 1 made a new record, the tonnage being 8,441,533. The receipts at Lake Erie ports amounted to 20,414,491 tons, compared with 35,195,758 tons for the season of 1907. It is estimated that the shipments for next year will amount to about 35,000,000 tons, compared with 25,427,094 tons for the season of 1908. On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.50; Mesabi Bessemer, $4.25; old range non-Bessemer, $3.70; Mesabi non-Bessemer, $3.25.

Pig Iron.—Holiday quiet prevails, the only inquiries of any size being 2,000 tons of No. 3 by an Ohio pipe interest, and 1,000 tons of No. 2, half southern and half northern, by another Ohio interest. Shipments on contracts are being promptly made, and in some cases anticipations are requested. No. 2 stack of the Cleveland Furnace Co. will be blown in about March 1. We quote, delivered in Cleveland, for spot iron as follows:

No. 1 foundry	$17.25 to 17.50
No. 2 foundry	16.75 to 17.00
No. 3 foundry	16.25 to 16.50
No. 2 southern	17.35
Gray forge	14.75 to 15.25
Bessemer	17.40 to 17.90
Lake Superior charcoal	19.50 to 20.00
Jackson Co. 8 per cent silvery	20.05

Coke.—With the exception of an inquiry from one furnace interest, the market is lifeless. Prices are firm, however. We quote standard furnace coke on contracts for the first half $1.90 to $2, and standard foundry coke at $2.35 to $2.50. Furnace coke is sold $1.70 to $1.80 for prompt delivery, and spot foundry coke at $2.15 to $2.25.

Finished Materials.—Mill interests report a fair run of small orders, but no large transactions have taken place. The Lake Shore railroad has purchased 300 kegs of bolts, but railroads are not large buyers of any kind of material at present. The elimination of the belt line grade crossings is expected to call for a fair tonnage of structural material, but these contracts will not be placed for some time. It is expected that the contract for the new building of the Brotherhood of Locomotive Engineers, involving about 1,500 tons, will be placed early in the new year. The Empire rolling mill is idle this week, and the Union is running only in part. It is expected that both mills will be in operation next week. Jobbers report that business is very dull.

Old Material.—Quietness has settled upon the market, and small quantities of material the past week have passed from dealers to consumers. The amount of business done also between dealers and brokers has been considerable, and it is the general belief that the turn of the year must be awaited for any appreciable change in present conditions. In the meantime, no changes have taken place in prices, and we continue to quote, f. o. b. Cleveland, as follows:

Old iron rails	$19.00 to 19.50
Old steel rails (re-rolling)	16.50 to 17.00
Old steel rails (under 6 ft.)	16.50 to 17.00
Old car wheels	15.50 to 16.00
Old steel boiler plate	13.50 to 14.00
Steel axles	20.00 to 20.50
Malleable iron (railroad)	15.00 to 15.50
Malleable iron (agricultural)	13.50 to 14.00
Heavy steel	15.75 to 16.25
Country mixed steel	13.50 to 14.00
Low phosphorus	17.00 to 17.50

We quote, net tons, as follows:

No. 1 R. R. wrought	$15.50 to 16.00
No. 1 busheling	13.50 to 14.00
No. 1 machine cast	13.50 to 14.00
Iron axles	19.00 to 19.50
Axle turnings	11.00 to 11.50
Machine shop turnings	10.00 to 10.50
Grate bars	12.00 to 12.50
Pipes and flues	12.50 to 13.00
Tank iron	12.50 to 13.00
Hoop and band iron	9.25 to 9.75
Sheet iron	8.50 to 9.00
Wrought drillings	9.50 to 10.00
Stove plate	12.50 to 13.00
Cast borings	8.50 to 9.00

CINCINNATI.

Leading Plumbing Interest Buys for Second Quarter—Market Quiet.

Office of THE IRON TRADE REVIEW,
First National Bank Bldg., Dec. 29.

Pig Iron.—The feature of the week under review was the purchase of about 8,000 tons by the Standard Sanitary Co. for its Louisville plant, for second quarter delivery. The tonnage was divided between four agencies and included No. 2, No. 3, foundry and gray forge, also some special iron. The foundry iron was sold on a basis of $13 Birmingham for No. 2; and the gray forge brought $12 Birmingham. The fact that large consumers, such as the Standard Sanitary Co. and the American Car & Foundry Co., are covering for the first half of the year is regarded as an indication of strength in the market. The general business of the week has been light and there is but little expectation of increased activity until after the holidays. A number of the salesmen are in this week and the offices are not attempting to push business. Prices remain unchanged and southern iron appears to be obtainable at $13 Birmingham for the first half and northern iron at $15.50 at furnace in the Ironton district. Shipments are going forward and consumers are taking their iron without requesting holdups; in fact, the shipments are unusually good for the season, as a number of requests to hold up shipments until after inventories are taken have been customary at this time of the year. It is a matter of comment in the trade that the new year will start with business affairs in so much better condition than a year ago that the outlook may be regarded as favorable to sustain prices. A change in freight rates from Hamilton, O., and from the Hanging Rock district is announced, effective Feb. 1. We quote for prompt delivery and for delivery over the first quarter of 1909, delivered Cincinnati, based on freight rates of $3.25 from Birmingham and $1.10 from Ironton, as follows.

Southern foundry No. 1	$16.75 to 17.25
Southern foundry No. 2	16.25 to 16.75
Southern foundry No. 3	15.75 to 16.25
Southern foundry No. 4	15.25 to 15.75
Southern No. 1 soft	16.75 to 17.25
Southern No. 2 soft	16.25 to 16.75
Southern gray forge	14.75 to 15.25
Northern No. 1 foundry	17.10 to 17.60
Northern No. 2 foundry	16.60 to 17.10
Northern No. 3 foundry	16.10 to 16.60
Northern 8 per cent silicon	19.60

Finished Material.—The market is quiet with no change in prices. Orders from stock have been light during the week, and the trade is under the influence of the usual holiday conditions. Small orders are filled here at the following prices:

Iron and steel bars, 1.85c to 2c, full extras. Angles, 3 x 3 and over, 2.10c to 2.25c; beams and channels, 15 inches and under, 2.10c to 2.25c; small angles and architectural channels, 2c base; plates, ¼-inch and heavier, 2c; 3-16-inch, 2.10c; No. 8, 2.15c; sheets, blue annealed, No. 10, 2.15c to 2.25c; No. 12, 2.20c to 2.30c; No. 14, 2.25c to 2.35c; No. 16, 2.35c to 2.45c; box annealed sheets, Nos. 18 and 20, 2.55c to 2.65c; Nos 22 and 24, 2.65c to 2.75c; Nos. 25 and 26, 2.70c to 2.80c; No. 27, 2.75c to 2.85c, and No. 28, 2.85c to 2.95c; boiler tubes, 2¼ to 5 inches, 62 per cent off base; turnbuckles, 45 per cent off; rivets, 3c base; cold and rolled shafting, 47 to 50 per cent off list; steel tire, 2.05c to 2.10c base.

Coke.—An easier tone prevails and some concessions have been made for prompt shipment of both furnace and foundry grades. Connellsville

foundry coke for prompt shipment has been sold at $2 at the ovens. Some grades of foundry coke, which have been held at a premium, have been offered at quotations closer to the ruling market. Foundries continue to buy for their requirements in the open market, and spot coke is from 25c to 50c per ton cheaper than the prices asked on contracts. Contract prices in the leading coke producing districts are as follows:

	PER TON.
Wise county furnace coke	$1.90
Wise county foundry coke	2.25 to 2.35
Pocahontas furnace coke	1.85 to 2.00
Pocahontas foundry coke	2.00 to 2.25
Standard Connellsville furnace coke	2.00 to 2.25
Standard Connellsville foundry coke	2.35 to 2.50

Old Material.—The market remains unchanged with consumers reluctantly paying the prices demanded and trying to buy pig iron of low grades to take the place of scrap. Dealers continue firm in their views and quotations remain as follows:

Old No. 1 R. R. wrought, net tons	$14.50 to 15.00
No. 1 machinery, net tons	13.50 to 14.00
Old iron rails, gross tons	18.00 to 18.50
Old steel rails (re-rolling) gross tons	16.50 to 17.00
Old short lengths, gross tons	16.50 to 17.00
Old iron axles, net tons	17.00 to 18.00
Heavy melting scrap, gross tons	14.50 to 15.50
Stove plate, net tons	11.00 to 11.50
Wrought turnings	8.00 to 8.50
Cast borings, net tons	6.00 to 7.00
Car wheels, gross tons	15.50 to 16.00

NEW YORK.

Contract for Russian Ore—Structural Contracts Awarded.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., Dec. 29.

Iron Ore.—It develops that eastern furnace interests have recently closed with a miner of Russian iron ore for about 100,000 tons for delivery during the coming year. This exhausts the allotment of this producer for American account, as very heavy sales have been made lately for shipment to Germany. No other foreign sales of consequence are reported, but it is probable that the recent heavy seller of Spanish ore will be able to make further offerings in this country. A Pennsylvania steel interest has purchased 10,000 tons of low phosphorus ore abroad. Considerable chartering is reported.

Pig Iron.—In the face of the current holiday inactivity, the market is featureless. Occasional sales of small lots are reported, practically all lines securing some business, and there is an urgent call for shipments, but the volume of orders now being placed is, of course, insignificant. Conditions appear ripe, however, for another good buying movement sometime during January, in which case an advance is generally predicted. Some purchasing is still to be done for the first quarter and relatively little has yet been done to cover second quarter requirements. Pipe irons seem increasingly strong and instances of price advances are coming to the surface. Otherwise the selling level for first quarter delivery is about the same, as follows:

Northern foundry No. 1	$17.75 to 18.25
No. 2X foundry	17.25 to 17.75
No. 2 plain	16.50 to 17.00
No. 2 southern foundry	17.25 to 17.75
Malleable	18.00 to 18.50
Basic	17.00 to 17.25
Gray forge	16.25 to 16.75

Ferro-Alloys.—Trading is light. A few sales of ferro-manganese in small lots are reported at $45, seaboard, for prompt shipment and a higher figure for later delivery. Ferro-silicon is also quiet, 80 per cent selling at $64, Pittsburg. There has been some selling of the lower grade alloy.

Finished Materials.—Several structural contracts have been closed during the week under review, although the aggregate tonnage is less than 10,000 tons. The Yorkfield apartment building at 116th street and Riverside Drive, 500 tons, has been let to the Prince Iron Works; the receivers of Milliken Bros. will furnish the steel, 650 tons, for the Demmon building, Boston; the Toledo-Massillon Bridge Co. has the order for 400 tons of bridge work for the Lake Shore at Chicago; the Riverside Bridge Co. will erect an 800-ton mill building for the Paul A. Sorg Paper Co., Middletown, O.; the Hart, Schaffner & Marx building at Chicago, taken by the American Bridge Co., will run close to 3,500 tons; and the Llewellyn Iron Works, Los Angeles, will supply 550 tons for a building for the Shields estate in San Francisco. The Terminal Warehouse Co., Baltimore, has let a 1,300-ton building to the Dietrich Construction Co., the fabricating to be done by the Jones & Laughlin Steel Co. The Fagin Iron Works has the contract for an 800-ton terminal building at Hoboken, N. J., for the Public Service Corporation. Levering & Garrigues have secured an 800-ton warehouse in the Bronx, and a power house at Vernon, Vt., has gone to an independent interest. The steel for the new foundry of the Otis Elevator Co., 500 tons, will be supplied by the McClintic-Marshall Construction Co. Considerable railroad work is coming up. The Lehigh Valley has inquiries out for 400 tons of light rails, and a sale of a much larger tonnage for colliery work was recently made to another interest. The Delaware, Lackawanna & Western is inquiring for two steel car floats, and bids close Dec. 31 on the Long Island freight shed.

New York City will have a 1,000-ton cast iron pipe letting Dec. 30, chiefly of 12-inch pipe. Baltimore has made an award of about 1,200 tons of small pipe to R. D. Wood & Co. Aside from this, the situation is unchanged and we quote:

Angles, 3 to 6 inches x ¼-inch and heavier, 1.76c; beams, 3 to 15 inches, 1.76c; tees, 3 x ¼-inch and heavier, 1.81c; plates, carloads, tanks, 1.76c; marine boilers, 2.16c; bar iron, 1.46c to 1.56c; soft steel bars, 1.56c; sheets, No. 28, black, 2.66c.

Old Materials.—The disturbance in the eastern Pennsylvania district occasioned by the controversy over prices on heavy melting steel has unsettled conditions locally and dealers are generally at sea. Some sales are being made, but at a wide range of prices, and accurate quotations are difficult to secure. Holders of some small accumulations in this territory have high ideas of its value and no important sales are resulting. We quote, gross tons, New York delivery, as follows:

Old steel rails (re-rolling)	$15.50 to 16.00
Relaying rails	21.50 to 22.00
Old car wheels	14.00 to 14.50
Old iron car axles	19.50 to 20.00
Old steel car axles	19.00 to 20.00
Heavy melting steel	15.00 to 15.50
No. 1 railroad wrought	17.00 to 17.50
Iron track scrap	14.50 to 15.00
Wrought pipe	12.50 to 13.00
Cast borings	10.00 to 10.50
Wrought turnings	11.00 to 11.50
Heavy cast scrap	14.00 to 14.50
Railroad malleable	13.00 to 13.50
Stove plate	10.00 to 10.50
Grate bars	11.00 to 11.50

PHILADELPHIA.

Pig Iron Dull and Salesmen Making Very Little Effort.

Office of THE IRON TRADE REVIEW, 408 Central Trust Bldg., Dec. 29.

Pig Iron.—With the holiday season at its height, the iron market is naturally extremely quiet, and selling interests are making practically no effort to secure business. A few scattered tonnages have been placed since our last report, among them a 3,000-ton lot of basic, several small blocks of forge iron and several unimportant lots of foundry. The strongest feature of the situation is the extent to which anticipations on contracts are being requested and the steady manner in which shipments are being received, one large producer declaring present conditions more satisfactory for this season than for a number of years. Traveling representatives of pig iron concerns state that they expect a buying movement of good vol-

ume to set in soon after the first of the year, as the general run of consumers have not fully covered their needs for the first quarter and will have to buy for practically their entire second quarter requirements. Pipe irons are increasingly scarce and several melters are constantly in the market in the sense that they are willing to take on good tonnages whenever a favorable price can be secured. The basic situation continues unchanged, except that the disabled Swede furnace has gone back into blast. No new business in low phosphorus iron is discoverable, but a sale of 3,000 tons by an eastern Pennsylvania producer to a neighboring wheel works has come to light, the transaction having been closed some little time ago. We quote, eastern Pennsylvania delivery, for the first quarter, as follows:

No. 1X foundry	$17.50 to 18.00
No. 2X foundry	17.00 to 17.50
No. 2 plain	16.50 to 17.00
Standard gray forge	16.00 to 16.50
Basic	16.75 to 17.25
Low phosphorus	21.00 to 21.50
No. 2 Birmingham	17.75 to 18.25
No. 2X Virginia	17.50 to 18.00
No. 2 plain Virginia	17.00 to 17.50

Finished Materials.—Current business is seasonably light and without feature, though the structural trade is looking for early activity on the large building to house the Curtis Publishing Co. The usual volume of ship yard work is reported by plate interests, and bar iron mills are seemingly in stronger position. We quote: Structurals, 1.75c to 1.90c; plates, 1.75c to 1.80c; refined bar iron, 1.50c to 1.60c; steel bars, 1.55c.

Old Materials.—With the center of interest held absolutely by heavy melting steel and a practical deadlock existing in that line, the current market is in a rather peculiar state. The situation is undoubtedly strong, so much so that those interests which are attempting to hold the delivered price on heavy steel down to $17 are not able to buy any considerable amounts at this figure. Another meeting of purchasing interests is announced for the latter part of the week. Heavy shipments are being received at Coatesville by the recent purchaser of 25,000 tons and the material is being handled in such good shape that no embargo is in prospect. This tonnage has all been covered by the first hands in the deal, but some covering by them with brokers is giving the situation a rather excited tone. Low phosphorus scrap is higher, recent sales on an exchange basis ranging between $21 and $22. We quote, gross tons, delivery at eastern mills, as follows:

Old steel rails (re-rolling)	$18.00 to 18.50
No. 1 steel scrap	17.25 to 17.75
Old steel axles	22.00 to 23.00
Old iron axles	25.00 to 26.00
Old iron rails	21.00 to 22.00
Old car wheels	16.00 to 16.50
Choice scrap R. R. No. 1 wrought	20.00 to 20.50
No. 1 yard scrap	18.00 to 18.50
Machinery scrap	16.00 to 16.50
Low phosphorus scrap	20.00 to 20.50
Wrought iron pipe	15.50 to 16.00
No. 1 forge fire scrap	15.00 to 15.50
No. 2 forge fire scrap, ordinary	10.00 to 10.50
Wrought turnings	13.50 to 14.00
Axle turnings, heavy	14.50 to 15.00
Cast borings	13.00 to 13.50
Stove plates	13.50 to 14.00

BUFFALO.

Building Activity at Syracuse—Pig Iron Quiet.

Office of THE IRON TRADE REVIEW,
932 Ellicott Square, Dec. 29.

Pig Iron.—Buying this week has been quiet and indifferent, but prices were not affected in any way. The strength and healthy tone of business, developed lately, has not depreciated and the closing out of the year and natural holiday apathy toward business are no doubt the cause of this quiet condition. The begining of the new year is anticipated with a good deal of interest by both buyer and producer. At this time, however, it may hardly be said that any great change in general conditions should be looked for with the beginning of the year 1909. We quote f. o. b. Buffalo, as follows:

No. 1 X foundry	$16.75 to $17.25
No. 2 X foundry	16.25 to 16.75
No. 2, plain	15.75 to 16.25
No. 3 X	15.50 to 15.75
Malleable Bessemer	17.00 to 17.50
Gray forge	15.25 to 15.50
Charcoal	20.50 to 21.00

Finished Products.—With the exception of activity at Syracuse, N. Y., the transactions in finished material have not been numerous the past week, but a good deal of business has centered about Syracuse which has taken the attention of the companies competing for business in that territory. Numbered among the specifications now out, or which soon will be, requiring structural steel, are plans for a new plant to be built by the Syracuse Cold Storage Co., involving about 400 tons; new plant for the Central City Roofing Co., 700 tons; one new building for the new Process Rawhide Co., 160 tons. It is reported on good authority that the Onondago Hotel Co., which will build a new spacious hotel in Syracuse, will have specifications out in February, 1909.

In Buffalo it now seems reasonably certain that the New York State Steel Co. will be able to resume operations at an early date and renew the manufacture of billets, blooms and slabs. The Seneca Iron & Steel Co. and Lackawanna Steel Co., both of Buffalo, have substantial orders for finished products and local mills believe good business will come with the beginning of 1909.

ST. LOUIS.

One Sale of Three Thousand Tons of Basic—Prices Firm.

Dec. 28.

Pig Iron.—One order for 3,000 tons of basic iron for delivery over the first quarter of next year was placed today by a St. Louis concern with one of the local melters. The price was not made known. This is the only order of any consequence that has been reported in this territory during the last week. Carload lots have been purchased in some instances, mostly for immediate shipment, but as a rule dealers seem inclined to hold off until after the turn of the year. Prices are firm at $13 to $13.50, Birmingham, for No. 2, and some dealers believe they will go higher when a buying movement starts. Our delivered quotations, to which the freight of $3.75 from Birmingham has been added, follow:

No. 1 southern	$17.25 to 17.75
No. 2 southern	16.75 to 17.25
No. 3 southern	16.25 to 16.75
No. 4 southern	15.75 to 16.25

Coke.—The coke market is not active, but there are some inquiries out for small quantities, and there are indications that schedule prices may be shaded for immediate shipment. The best-selected 72-hour Connellsville furnace coke still is held at $2.25 to $2.75; Connellsville foundry, 48-hour coke at $2 to $2.25, and Virginia and West Virginia coke at $2.50 ovens. The freight rate from Connellsville and the Virginia and West Virginia fields to East St. Louis is $2.80, and $2.70 from the Virginia and West Virginia fields when the shipment is destined beyond St. Louis.

Old Material.—Quotations on scrap iron remain as follows:

Cast iron borings, free from foreign material, net tons	$ 6.00
Steel axle turnings, gross tons	12.25
Steel railroad axles, net ton	17.50 to 18.50
Iron railroad axles, net ton	19.00 to 20.00
Miscellaneous steel scrap, gross ton	12.25
Old car wheels, gross ton	16.00
No. 1 railroad cast scrap, net ton	12.00 to 12.50
Heavy machinery cast, net ton	13.00
Stove plate and light cast, net ton	11.50
Sheet iron, net tons, uncut	5.00
No. 1 railroad wrought, net ton	12.00 to 13.00
Railroad malleable, net ton	11.50
Heavy melting steel, net ton	11.50 to 12.00
Relaying rails, net ton	14.00 to 15.00

BIRMINGHAM, ALA.

Extreme Quiet Prevails—Moving Pig Iron Sold to Brokers.

Birmingham, Ala., Dec. 28.—The holiday dullness is just as intense now as it was in former years. Up to the past week it was believed there would be a difference

this year, but some of the active men in the market state that the buying has practically ceased, even with the smaller manufacturers who have been selling in small lots. The buying movement is expected to be on in full force again by Jan. 15. Preparations have been put under way for a general resumption of operations at furnaces and during this week the Tennessee company will be getting iron again from its No. 6 furnace at Ensley while from three to five other furnaces, now idle, will be making iron in January.

No time was lost during the holiday period at the cast iron pipe plants in this district. There is a steady outward movement of the product and new orders either received or bid on will require a large production for some time to come.

The next thing of importance in the iron trade on the calendar for consideration is the moving out of a large amount of accumulated iron, sold to brokers during the dull period with the stipulation that it was not to be placed on the open market until 1909. It is believed that this iron, which amounts to about 39,000 tons, if not more, will be moved out in quick order.

BRITISH IRON MARKET.

Cheerful Tone of American News Has Encouraging Effect.

Office of THE IRON TRADE REVIEW, Prince's Chambers, Corporation St., Birmingham, Eng., Dec. 19.

After a slight check, the pig iron buying movement has this week set in again in earnest. The result is that Cleveland No. 3 is now selling at 49s 6d ($12.12), an advance of 9d on the week. Warrants have also increased by about 10½d. The feeling in Cleveland is unusually buoyant for the time of the year, largely on account of the somewhat extensive forward buying. The present quotation for three months is 50s ($12.24) The very cheerful tone of the American reports this week has stimulated the market. All the same, stocks continue to increase, the amount added this month being 9,164 tons, the total now in store being 117,464 tons. This is an increase of about 70,000 tons on the minimum. The same conditions substantially prevail on the Birmingham market, where sellers have been able to secure advances of 6d to 1 shilling per ton, and furnaces throughout Northamptonshire, Derbyshire and Staffordshire have all booked through the first quarter of the year. As a rule, contracts to June are declined, in the belief that better prices will come with the new year. The hematite market continues rather slow with 56s ($13.70) for mixed numbers on the east coast. But there are no stocks, all the iron produced going into consumption. A weak place in the situation is that although there are more inquiries the finished iron trade shows no material improvement. But stocks are almost non-existent and it is believed that big orders will be placed for warehouse renewals early in the new year.

With regard to the steel trade, it is significant that the works of Alfred Hickman Ltd., the largest makers of basic steel in the Midlands, have contracts booked until June, and Sir Alfred Hickman, in a conversation with THE IRON TRADE REVIEW representative, expressed the strongest belief that better times are in store for next year. This is an idea becoming quite generally prevalent.

The great concern of Cargo Fleet, of Middlesbrough, has just issued its report for the year ended September. On the whole, it is a depressing document. The firm made a working profit of £30,119, but after deducting debenture interest and various other items amounting to £76,053, there is a deficiency of £45,934. The directors attribute their losses to bad times and labor troubles which on two occasions threatened to close the works.

METAL MARKET

CHICAGO.

Dec. 29.

Compared with other metals, there has been a very good movement of copper in the past week. Orders are largely for delivery during the first three months of the year. Prices are unchanged. Lead, tin and zinc have been very quiet. We quote as follows:

Lake copper, carload lots, 14¾c to 15c; casting, carload lots, 14½c; pig tin, 31½c to 31¾c; spelter, 5c to 5.25c; pig lead, desilverized, 4.40c to 4.45c in 50-ton lots; corroding, 4.85c to 4.95c in 50-ton lots; car lots, 2½c per 100 pounds higher; sheet zinc, 7c list, f. o. b. LaSalle in car lots of 600-pound flasks; Cookson's antimony, 10½c to 11c; other grades, 10c.

The old metal trade has lacked enough transactions to establish any changes in prices and we quote to dealers as follows:

Copper wire, 12¾c; heavy copper, 12¾c; light copper, 11½c; heavy red brass, 11¾c; heavy yellow brass, 8¾c; light brass, 6¾c; No. 1 red brass borings, 9¼c; No. 1 yellow brass borings, 9¼c; brass clippings, 8¾c; tea lead, 3¼c; lead scrap, 3¾c; zinc, 3.25c; tin plate, 24c; tin foil, 23c; pewter, 16c; electrotype plates, free from wood, 4c; electrotype dross, 2¾c; stereotype plates, 4¼c; stereotype dross, 3c; prime slab zinc dross, $55 per ton.

NEW YORK.

Dec. 29.

Copper.—The market has assumed a decidedly stronger tone in view of the heavier buying by domestic consumers and the improvement in prospective business. Heavy inquiry circulated early this week resulted in the marking up of quotations on the New York Metal Exchange for the first time in over a month. We quote: Lake, 14¼c to 14½c; electrolytic, 14c to 14¼c; casting, 13⅞c to 14⅛c.

Pig Tin.—The situation is stronger, though the holiday season has cut down current business. The foreign market is firmer. We quote: 4.12½c to 4.15c, New York.

Pig Lead.—A reduction by the leading interest a week ago has not stimulated business to any great extent. We quote: 4.12½c to 4.15c, New York.

Spelter.—The situation is unchanged at 5.10c to 5.15c for New York delivery.

Antimony.—Cookson's, 8.15c to 8.25c; Hallet's, 8c to 8.10c; ordinary brands, 7.75c to 7.87c.

ST. LOUIS.

Dec. 29.

Lead and Zinc.—There was very little competitive bidding for zinc ore in the Missouri-Kansas field last week, with the result that the average base selling price was $41 a ton, a decline from the preceding week. Low grade ore of the Miami district brought as high as $45 base, and the Webb City medium grades as much as $42. Much of the Joplin ore was disposed of at $43.50, assaying better than 60 per cent. The same ore for the week before sold for $44.50. Quite a number of large producers are resuming operations, and the output soon will be increased.

Lead was dull at $48 to $49 a ton, with a few choice lots bringing $50. Silicate sold for $18, with a high price of $21. Lead quotations for St. Louis dropped from $4.10 to $4.05. Spelter was firm at $5.05.

NEW FREIGHT RATES FROM SOUTHERN OHIO FURNACES.

It is announced that, taking effect Feb. 1, 1909, some advances in freight rates will be in force from the Hanging Rock, Ironton district, and from Hamilton, O. A comparison of present rates and the new rates is given below:

From Ironton, O., to—	Present rate.	New rate.
Cincinnati	$1.10	$1.20
Dayton, O.	1.10	1.15
East St. Louis	2.35	2.50
Indianapolis, Ind.	1.45	1.50
Kokomo, Ind.	1.45	1.50
Litchfield, Ill.	2.35	2.50
Marion, Ind.	1.45	1.50
Springfield, O.	1.05	1.15
Terre Haute, Ind.	1.75	1.90
Springfield, Ill.	2.35	2.50
From Hamilton, O., to—		
Chicago, Ill.	$1.80	$2.05
East St. Louis	2.10	2.25
Springfield, Ill.	2.10	2.25
Springfield, O.	.75	.85
Indianapolis, Ind.	1.10	1.15
Dayton, O.	.60	.65
Cincinnati, O.	.40	.50
Marion, Ind.	1.10	1.20
Terre Haute, Ind.	1.40	1.55
Kokomo, Ind.	1.10	1.15

Beaumont Iron Works Report.—Receiver A. B. Brock has filed a creditable report on the operation of the Beaumont Iron Works, Beaumont, Tex., for the year ending Oct. 31. The plant is being operated on full time, has a number of orders on the books in course of construction, and this, with the excellent financial statement, has led to the discussion of plans for re-organization with increased capitalization. The financial statement shows that on Jan. 24, 1908, the assets of the company were $172,808.81, and the liabilities the same. From Jan. 24 to Oct. 31 the gross earnings of the company were $47,841.33, while the cost of operating was $45,596.52, and the credit balance to the receiver being $2,254.81. The company's accounts payable during the receivership have been reduced $11,966.84. Permanent improvements have been made in the plant, especially in the car works department.

Chemical Engineers Meet.—The first annual meeting of the American Institute of Chemical Engineers, was held at the Carnegie Technical Schools, Pittsburg, Dec. 28 and 29. Papers upon various subjects, pertaining to applied chemistry were read. The one hundred visitors present inspected several of the steel works and other industrial plants of interest about Pittsburg. At the election of officers, the present corps was re-elected as follows: President, Samuel P. Sadtler, Philadelphia; vice presidents, Charles F. McKenna, New York; H. A. Hunicke, St. Louis; Edward G. Acheson, Niagara Falls, N. Y.; secretary, John S. Olsen, Brooklyn; treasurer, Wm. A. Booth, Syracuse, N. Y.; auditor, Richard K. Meade, Nazareth, Pa.

Fatal Furnace Accident.—Ten laborers were killed and several others injured, as well as two foremen, Dec. 28, by the caving in of a trench at the Tennessee Coal, Iron & Railroad Co. blast furnace plant at Ensley, Ala. The men were excavating for a gas flue with which it is proposed to connect the furnace stacks with a new battery of boilers. Through the breaking of a mechanical carrier, a cement wall forming one side of the trench fell upon the men. At the same time, the brick work at the end of the 4-foot gas main broke, and the entombed men were surrounded by the gas, making the recovery of their bodies difficult.

The Olds Motor Works, of Lansing, Mich., has entered the General Motors Co., of New Jersey, a corporation with $12,500,000 capital stock. The Olds Motor stockholders have received notice that they may exchange their stock for stock in the General Motors Co., receiving $4 in preferred and $1 in common stock in the New Jersey corporation therefor. No transfer of the property or assets of the Olds Co. is made.

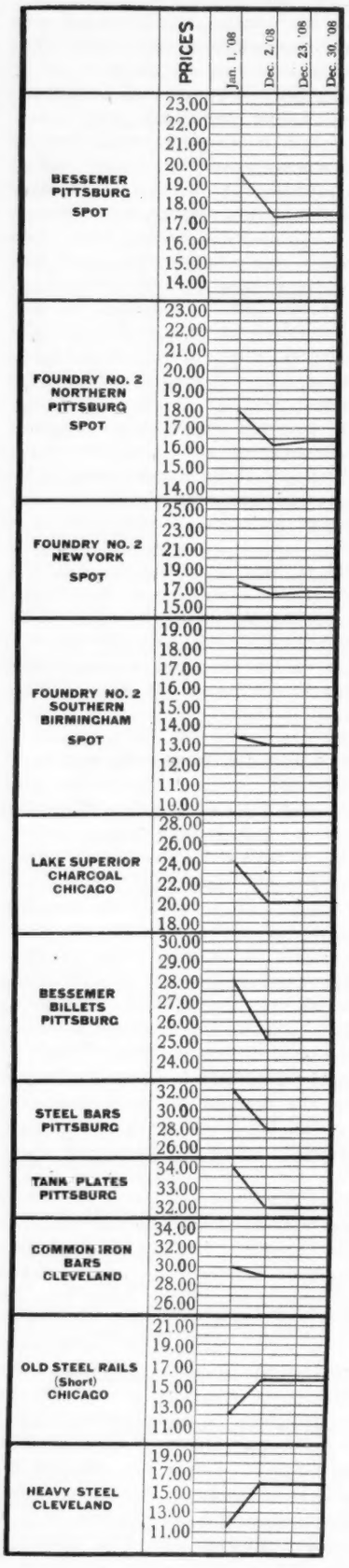
The property of the Lebanon Iron & Steel Co., a skelp mill at Lebanon, Pa., has been sold under a mortgage foreclosure for $225,000. The property was bought in by the Pennsylvania & West Virginia Steel Co., which, it is said, will re-organize the property. The plant has been idle for several months in the hands of the receiver.

Transcontinental and southeastern railroads have agreed on a rate of $13.20 a gross ton on pig iron from producing points in Alabama, Georgia and Tennessee to Pacific coast terminals. From several foundry points the rates on cast iron pipe are to be advanced to the Pittsburg base.

Construction work at Mulga mine of the Birmingham Coal & Iron Co. has been completed. The mine equipment, including electric and compressed air apparatus, is said to equal that of any mine in either the north or south.

The Friedrich Krupp Co., Essen, Germany, has declared a dividend of 8 per cent on £9,000,000 capital, a reduction of 2 per cent. The net profits reported are £929,400 as compared with £4,252,600.

PRICE CHART.



THE PORTLAND SCHOOL OF TRADES.

On Sept. 14, 1908, the board of education of Portland, Ore., established the second public trade school in the United States. The Portland School of Trades, as it is called, is the only one of its kind west of the Mississippi river. A similar school was opened at Milwaukee, Sept. 21, which, with the one at Philadelphia, now in its third year, makes three such institutions in the country.

The Portland school is not a manual training school or a technical high school, but is just what its name implies—a school of trades. Its aim is to fit boys with mechanical tastes and abilities to become skilled and useful artisans in their respective lines. The work is intensely practical and the school is receiving the enthusiastic support and co-operation of the Portland manufacturers and iron trade interests.

Heretofore the aim of the public school system of the country generally, above the eighth grade, has been to fit its pupils for college, office or professional life, while the great number of boys who must earn their living by the work of their hands have been left to shift for themselves. This lack of proper provision for the training of skilled workmen coupled with the specialization in vogue in modern factories has caused an actual dearth of all-around, skilled machinists which has alarmed the most far-seeing factory managers. As a result many manufacturers have spent much time and money in developing suitable apprenticeship courses, while several privately endowed trade schools of excellent quality have been in successful operation for some years. But these efforts, commendable as they are, cannot take the place of the trade school that is a part of the American public school system. The public trade school has several advantages over the private institution; it is free, it is comparatively unhampered for funds, being dependent only on the taxing power of the community, and it is independent of and separate from all personal or commercial bias. For this reason the Portland experiment, splendidly equipped, liberally managed and patronized as it is, is of unusual interest and significance. It is part of a great movement for the amalgamation of the essentially practical with the purely theoretical and cultural in our educational system.

Two things are essential in a successful trade school: Modern and adequate equipment and competent teachers. The Portland School of Trades is well provided along both of these lines. The school is housed in a three-story annex to the Atkinson building at 11th and Davis streets, a central and convenient location. It is provided with a pattern shop, molding room, machine shop, electrical laboratory, drawing rooms, physical and chemical laboratories and class rooms.

The pattern shop, shown in Fig. 1, is in a spacious room on the first floor and is fully equipped with machinery of the latest type. This equipment includes one 36-inch, motor-driven band saw; 16 motor-head pattern lathes furnshed by the Oliver Machinery Co., Grand Rapids, Mich.; one Oliver trimmer; one 24 x 6-inch surfacer; one Cleveland grindstone; one revolving oil stone; 16 benches fitted with drawers and rapid-acting vises; one glue heater and glue bench; small tools and auxiliary equipment. Every tool is individually driven by a variable-speed, 220-volt, direct-current motor.

The molding room, about 35 feet square, is adjacent to the pattern shop. It is fully equipped with sand bins, benches, flasks, riddles, core benches, etc. It is also provided with a lead-melting furnace, and later a brass furnace is to be added. A practical course in foundry practice is not offered; the molding room is used in connection with the courses in pattern making, teaching the principles of molding to the patternmakers.

The machine shop, illustrated in Fig. 2, is in the basement. This shop contains 18 Prentiss vises, one Brown & Sharpe universal milling machine, one 16-inch Gould & Eberhardt shaper, one 14-inch x 6 feet American lathe, one 14-inch x 8 feet Lodge & Shipley lathe, one Prentiss lathe 12 inches x 6 feet, one 20-inch x 8-foot LeBlond lathe, one 22-inch Clark drill press, one Worcester sensitive drill press, one 24 x 24-inch x 6-foot Cincinnati planer, one power hack saw, one Garvin motor-head speed lathe for brass turning, face plates, chucks, small tools and complete auxiliary equipment. Every tool is individually motor-driven and the machine tools are the latest and most improved patterns of the builders.

In addition to the shop equipment there is a complete electrical laboratory, drawing rooms, apparatus for teaching the plumbing trade and the regular class and assembly rooms.

The teachers are men of experience along both pedagogical and practical lines and were selected specially for their shop and commercial experience. The faculty is composed of George W. Hamilton, principal; George H. Buxton, instructor in machine shop practice; Charles A. Marlitt, instructor in pattern making; Otto P. Guidemeister, instructor in electricity and drawing; L. T. Newton, instructor in mathematics and English, and P. P. Sullivan, mathematics, English and drawing.

Boys with a common school education or its equivalent are admitted, although some high school graduates are now attending. The entrance requirements are purposely made liberal to encourage boys with mechanical tastes who will develop into skilled workmen. The incompetent and unfit are soon weeded out. The course is three years, although ambitious boys are encouraged to finish in less time. Thirty hours per week are devoted to school work, 15 in the shop and 15 in the drawing and class rooms. Only such class-room work is given as has a direct bearing on the trades being taught. Languages, history and literary courses are omitted and in their stead is substituted practical work in mechanical drawing, mathematics, applied physics, industrial chemistry and English. Courses in electrical construction, mechanical and architectural drafting, plumbing, carpentry, pattern making and machine shop practice are offered. The enrollment at the school is 120 at present.

The courses are designed to train practical, competent mechanics, not theorists. After a certain number of preliminary exercises, the boys are set to work turning out commercial articles. This is where the work differs from that of a manual training high school. For instance, when the writer visited the school, the pupils were working on a lot of 40 wood-lathe chucks, which had been designed by the students under the direction of the instructor. The necessary patterns were made at the school and the finished chucks were being manufactured in the machine shop. Another line of work now under way is the construction of some additional pattern shop lathes. The school is imbued with the manufacturing spirit.

The school is managed by the board of education of the city of Portland, under the supervision of Frank Rigler, superintendent. The Portland School of Trades is not only a success in itself but, what is more significant, is awakening a lively interest in industrial education in all the adjacent cities of the Pacific coast. This interest promises to result in more institutions of similar character in the near future.

THE IRON TRADE REVIEW

Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades

PUBLISHED EVERY THURSDAY BY
THE PENTON PUBLISHING CO.
CLEVELAND.

BOSTON.....73-74 Journal Bldg.
BUFFALO.....932 Ellicott Sq.
CHICAGO.....1328 Monadnock Blk.
CINCINNATI.....First National Bank Bldg.
NEW YORK.....1005 West Street Bldg.
PHILADELPHIA.....408 Central Trust Bldg.
PITTSBURG.....510 Park Bldg.
SEATTLE.....302 Pioneer Bldg.

Subscription, United States and Mexico, $3.00 per annum. To Canada and Foreign Countries, $4.50. Advertising Rates Furnished on Application.

Change of advertising copy must reach this office ten days preceding date of publication.

The Cleveland News Co. will supply THE IRON TRADE REVIEW through the regular channels of the American News Co.

European Agents: The International News Company, Breams Building, Chancery Lane, London, E. C., England.

ENTERED AT THE POST OFFICE AT CLEVELAND AS SECOND CLASS MATTER.

PRINTED IN AN OPEN SHOP.

COPYRIGHT 1908 BY PENTON PUBLISHING CO.

December 31, 1908.

A VERY SIMPLE QUESTION.

The question decided by Justice Wright, of the Supreme Court of the District of Columbia, in the case of the Bucks Stove & Range Co., St. Louis, against Samuel Gompers and others, was whether a person enjoined by the court shall respect the injunction until the merits of the controversy have been determined. After sentence had been passed, Mr. Gompers made a characteristic speech, in which he talked about not having violated any law of the country or of the state in which he lives, and about the alleged struggle of the working people, but he avoided the point at issue when he failed to deny that he had violated the injunction issued by Justice Gould.

In the preliminary hearing, Justice Gould had determined that a conspiracy existed, and he issued an injunction to prevent the continuance of the name of the St. Louis concern on the so-called unfair list. All that remained for Justice Wright to decide was whether the injunction had been violated. On this subject he said:

"That Gompers and others had in advance of the injunction determined to violate it if issued, and had in advance of the injunction counseled all members of labor unions and of the American Federation of Labor and the public generally to violate it in case it should be issued, appears from the following, which references point out also the general plan and mutual understanding of the organizations and their various members."

The court here read a mass of extracts from reports of proceedings of conventions of the federation, reports of President Gompers, editorials of the *Federationist* and of the labor press generally in support of his statement that there was a predetermination to violate.

The court, after quoting at great length the attitude taken by Mr. Gompers since the injunction was issued, his writings, interviews and public addresses, remarked:

"All of which was done, all of which was published, all of which was circulated in willful disobedience and deliberate violation of the injunction and for the purpose of inciting and accomplishing the violation generally, and in pursuance of the original common design of himself and confederates, to bring about the breach of plaintiff's existing contracts, deprive plaintiff of property, restrain trade and restrain commerce among the several states."

Free speech does not give license to publish anything that an editor pleases regardless of whether it violates an injunction or not, and Mr. Gompers' talk about free speech was not pertinent. If he had desired to present evidence that he had not violated the injunction, that was his privilege, but he failed to do so. He preferred to rest his case upon alleged rights which do not in fact exist. Gompers and the other defendants announced even before the injunction was granted that neither they nor the American Federation of Labor would obey it, and they accordingly refused to obey it. "There was," as the justice said, "a studied, determined conflict, precipitated in the light of open day, between the decrees of a tribunal ordained by the government and the labor union; one or the other must succumb. For those who would unlaw the land are public enemies."

Gompers, Mitchell and Morrison will attempt to pose as martyrs, and some may doubt the wisdom of the decision because it gives the defendants this opportunity, but the majesty of the law must be upheld, even if it does afford an opportunity for labor agitators to obtain the notoriety they seek. The decision comes as a timely warning to all law violators that the injunctions of the courts must be respected. If the labor unions are wise, they will themselves conclude that as long as they countenance lawlessness, and directly or indirectly participate in it, they can not have the respect of the law abiding people of the nation, and the sooner they mend their ways and take a firm stand in favor of abiding by the laws, unjust though some of them may be, the better it will be for the cause of labor.

REQUIESCAT IN PACE!

The year in the iron trade which is just closing will be memorable more for what did not happen than for what did happen in it. Demand for iron and steel was reduced by more than 50 per cent, as compared with the previous year, and yet there was no wild scramble for business. That is the most important thing that did not happen.

It has been customary to talk of the policy pursued now for 13 months by the steel producers as a price maintenance policy, but the term is not accurately descriptive. It has been explained that the rigid maintenace of former prices was not what was aimed at, the object rather being to prevent a wild and unreasonable competition for a tonnage which obviously fell far short of being sufficient to satisfy all. It was an incident of this effort to avoid such disorganization that the best range of prices to adhere to was felt to be the range to which the trade had already been accustomed. There was no expectation, as was pointed out by Judge Gary early in April and again late in May, that any reductions would be made, at least until plenty of time had

been taken for deliberation, but when some price cutting developed, prices were promptly dropped to a new level which it was believed could be maintained. There was no hard and fast rule in the matter of prices, then, beyond the very great desire to avoid severe and hurtful competition, with a wholly disorganized market.

That object has been fully attained; it is not that prices have been maintained, but that disorganizing competition has been avoided. It is an achievement of which the leaders may well be proud. It is quite possible however, that, had some in the trade been able to foresee how long the lean period was destined to last, their support to the movement would not have been as hearty as it was.

The total decline in prices of finished steel products, from Jan. 1 to Dec. 31, only averaged $2.50 and $3 per gross ton. This estimate is based upon an average of each reduction in proportion to the tonnage produced in normal times, and takes account of the fact that standard rails were not reduced at all, this having a tendency to maintain the average level. It takes cognizance of the sheet and tin plate reductions on Jan. 6, the bar, hoop and small shape reductions on June 1 and the plate, shape, wire and pipe reductions on June 9. Never before in the history of the iron and steel industry has there been such a decrease in demand with so small a decline in prices.

It was remarked that demand was reduced by more than 50 per cent this year. Issue may be taken with that statement on the ground that production this year has been considerably more than 50 per cent of last year's production. There was, however, a great deal of production which was not based upon current demand, but was the fulfillment of orders placed in 1907. Thus the American Bridge Co. entered the year with unfinished orders sufficient to keep its plants operating for more than six months at not far from their full capacity, the contracts having been booked before the financial panic. The car builders carried over a considerable amount of work, representing obligations entered into long before. Then there was the export demand, which underwent a relatively slight decrease, and helped to maintain production. Had there been no export trade, with its relatively light decline, the percentage reduction in total output would have been sharper.

The carrying over of unfinished business from 1907 explains the one irregularity which has been observed in the course of pig iron production this year. Our monthly report of pig iron production, which constitutes a very accurate index of general iron and steel activity, showed a rather rapid increase in output from January to a high point in March, then a much lower decline monthly to June, making the June output only a trifle above that of January, then a steady increase, month by month, to the end of the year.

The increase to March represented in large part the resumption or continuance of work on old contracts, but after March such old work began to play out, at a more rapid rate than fresh work came in, and it is probably perfectly fair to assume that if such old work were eliminated from the reckoning there would be found to have been a steady increase in new work beginning with January and running right through June, so that instead of there being a high point through March, with a low point in June, there would have been a steady increase in tonnage, month by month, right through the year.

That there has been such an increase, and a very steady one, since June, the figures presented monthly have shown, and it is the most pleasing part of the 1908 record that its worst features were therefore in the early part of the year, the latter part having established a pace of improvement which it is the hope on all sides will be continued into the new year.

Probably the most common feeling among iron and steel interests with reference to the year 1908 is satisfaction that it is over. Let it rest in peace.

The pig iron production in the year has been a trifle under 16,000,000 tons, a total which compares unfavorably with the 1907 record, 25,781,361 tons, and is less than the output in any calendar year since 1901. It is, on the other hand, in excess of the tonnage of 1901 or of any previous year, is double that of any year prior to 1890, and is four times that of any year prior to 1881, so that after all the country has been using a good bit of iron. In 1887, the record year for railroad building, with 12,000 miles of new road constructed, our pig iron production was only 6,417,148 tons.

The statistics of steel production in 1908 will undoubtedly show that the open-hearth process has passed the Bessemer in point of tonnage. In 1907 it just fell short of distancing its rival, and with the operation of some new open-hearth capacity and the absence of one important Bessemer plant which contributed its production for eight months of 1907, together with the greatly lessened demand for Bessemer rails, there is no question that in 1908 the open-hearth process has left the Bessemer process far behind.

It does not follow, however, that because the open-hearth process passes the Bessemer at such a rapid gait the gain can be continued indefinitely. These processes are customarily measured in terms of steel ingot production. As a means of converting pig iron into finished steel the open-hearth process is still far behind, as it consumes about all of its own scrap and nearly all the scrap the Bessemer plants make. One reason why the open-hearth process has gained so rapidly has been because of the large tonnage of scrap available from the Bessemer plants. The supply of scrap has been diminishing, in proportion to the requirements, and already much dependence has come to be placed upon processes which do not require scrap.

On all hands the hope is entertained that the new year will prove much better than its predecessor, and these hopes are certainly well grounded when it is considered that bad as 1908 has been, it has really shown, making allowance for the completion of old work in the early part, a steady improvement month by month in fresh demand. It would be strange indeed if the new year could not continue the good work. The showing of railroad earnings has changed and of late has been promising. The financial skies have been getting clearer and clearer, and from living in hand to mouth manner consumers may soon begin to look ahead and venture into the market with more confidence.

DEATH OF JAMES CORRIGAN.

James Corrigan, head of the firm of Corrigan, McKinney & Co., died at his home, 8114 Euclid avenue, Cleveland, on Dec. 24, of peritonitis. He was stricken with the disease in his country home in Wickliffe last September and was critically ill there for several weeks, but later appeared to be well on the road towards recovery. He suffered a relapse at the city home, however, from which he found it impossible to rally.

The history of James Corrigan's life is that of a man who succeeded in business through the possession of a bold and original mind though denied every advantage of early training and education. He was born on May 1, 1848, at Morrisburg, Ont. His mother died when he was 11 years old, leaving five children. His father married again shortly thereafter, and James, with his elder brother, John, finding the home not congenial, left it to make their living together. They went to Oswego, N. Y., where they made their living sailing on the lakes.

John Corrigan later went to Cleveland and engaged in the oil business. James had meanwhile purchased the little schooner Trial, and, after sailing her on the lower lakes, took her to Cleveland with the intention of entering the fruit trade. He, however, abandoned this for the more lucrative business of oil refining. In this business he thrived, winning huge profits, and conducted it as an independent refinery until 1881 when he entered the Standard Oil combination.

In the interim, however, he had not suffered his lake interests to lapse, continuing to add to his fleet of vessels as the commerce of the lakes increased. His early investments were in schooners. Among those which he owned were the Niagara, Lucerne, Polynesia, Northwest, J. M. Hutchinson, Halleran, Michigan, Marion Page, Charles Foster, Frank D. Owen, Iron Cliff, David Dows, George W. Adams and many others. As the trade grew and schooners became too slow, he added steamers to his fleet and at one time or another owned the steamers Raleigh, Aurora, Roumania, Australasia, Bulgaria, Caledonia, Italia, J. Emory Owen, St. Paul, M. M. Drake, Quito, Minnesota, Iron Age, Iron Duke, Iron Chief, Wallace, Australia, Amazon, Polynesia and Aurania.

James Corrigan was one of the earliest to recognize the limitless possibilities of the Lake Superior iron country for the creation of wealth and it was a natural step from the carrying of ore to the mining and smelting of it. He became a consistent buyer of Lake Superior ore properties and at the time of his death was the most extensive independent operator on the ranges. On the Mesabi range the firm owned the Admiral, Commodore, Jordan, St. James, St. Paul, Stevenson and Wallace mines; on the Gogebic, the Colby, Colby No. 2, Ironton, and Ironton No. 2; on the Menominee the Armenia, Baker, Basic, Crystal Falls, Dunn, Fairbanks, Genesee, Great Western, Groveland, Kimball, Lamont, Lincoln, Paint River, Quinnesec and Tobin; on the Marquette the Star West mine.

One illustration alone will suffice to show Mr. Corrigan's daring temper as an operator in iron mines. When the steel corporation was formed the Stevenson mine was passed over as a doubtful asset. Corrigan, McKinney & Co. acquired it and poured thousands into exploration and development, with the result that in the second year of the new ownership the mine produced nearly 1,500,000 tons at an average profit for that year of about $1 per ton.

His firm's furnace interests embraced the Genesee Furnace Co., at Charlotte, N. Y., the Scottdale Furnace Co., at Scottdale, Pa., and the Josephine Furnace & Coke Co., at Josephine, Pa. At Josephine, the firm founded a town as well as a furnace. He had also planned to build a new furnace on the Cuyahoga river at Cleveland, under the name of the River Furnace & Dock Co. This is expected to be in operation in 1910. Mr. Corrigan also held extensive copper interests in Mexico. Of late years he had gradually abandoned the operation of vessels, the existing fleet

JAMES CORRIGAN.

of Corrigan, McKinney & Co. consisting only of the Australia, Amazon, Polynesia and Aurania.

In personal character, James Corrigan was a plain, blunt, straightforward man. In all his dealings, he never beat about the bush. His method of attack was direct and everyone knew precisely where he stood. He was a fearless, earnest man, who took great losses and great gains with equal composure. He was one of the group of giants who as young men in the 70's began to develop the latent natural resources of the country. He was associated in business with many men now recognized as industrial captains. Considerable newspaper space was given to his controversy with Mr. Rockefeller regarding the purchase by Mr. Rockefeller of some Standard Oil stock which had been offered as collateral for loans made to develop Lake Superior iron mines. Whatever may have been the morality or ethics of the transaction, successive courts held that Mr. Rockefeller was well within his legal rights. The case attracted national attention, owing to the fact that Mr. Rockefeller's brother, Frank, was associated with Mr. Corrigan in the mining enterprises and both felt that they had not been fairly dealt with.

It was largely through James Corrigan's influence that the Cleveland Vessel Owners' Association was consolidated with the old Lake Carriers' Association in 1892 and in 1894 he was elected president of the Lake Carriers' Association.

His life was strenuous from beginning to end. Everything about his career was uncommon. Both fortune and fate dealt largely with him. The severest blow of all was the almost total extinction of his family by the capsizing of the schooner yacht on Lake Erie about six years ago. He had been on a cruise with his family and, not having further time to spare, had left the yacht in Detroit, taking the train to Cleveland. The yacht proceeded down the river to Lake Erie and was capsized near the islands. In that disaster, he lost his wife and three daughters, a grandchild and a niece. Mrs. John Corrigan was the sole surivor. She happened to be on deck and was rescued by a small boat that was near by. All the rest were in the cabin when the Idler capsized and had no chance to escape. The only surviving child of James Corrigan is his son, James W., the only member of the family who was not aboard the Idler at the time.

NEW RECORD

For Ore on Docks at Close of Navigation—Receipts at Erie Ports.

The figures compiled by the MARINE REVIEW from the returns sent in by the various dock companies show that iron ore receipts at the Lake Erie ports during the season of 1908 were 20,414,491 tons, out of a total movement of ore by lake of 25,427,094 tons. Lake Erie docks on Dec. 1 held a balance of 8,441,533 tons, which is the largest store on hand in the history of the traffic, the previous high figure being in 1907, when 7,385,728 tons were on hand. During 1907 the total shipment by lake was 41,288,755 tons, of which Lake Erie docks received 35,195,758 tons and held a balance on Dec. 1, 1907, of 7,385,728 tons. During 1906 the total shipment by lake was 37,513,595 tons, of which Lake Erie docks received 32,076,757 tons and held a balance on Dec. 1, 1906, of 6,252,455 tons. The reserve of 8,441,533 on Lake Erie docks Dec. 1 is ample for winter consumption. Never in the history of the trade has 5,000,000 tons gone forward from dock to furnace during the winter season.

Shipments to furnaces between May 1 and Dec. 1, 1908, aggregate 17,453,258 tons, compared with 29,787,018 tons in 1907, compared with 27,615,392 tons in 1906, with 24,311,720 tons in 1905, with 16,658,806 tons in 1904, with 16,903,013 tons in 1903, with 18,423,364 tons in 1902 and with 14,204,596 tons in 1901.

The shipments to furnaces during the season of navigation as referred to are determined in this way: First we have the amount of ore on Lake Erie docks before the opening of navigation May 1, last, 5,480,300 tons; add to this the receipts of the season just closed, 20,414,491 tons, and the total is 25,894,791 tons; deduct the amount on dock Dec. 1, 8,441,533 tons, and we have 17,453,258 as the amount that was forwarded either direct or from dock to furnace yards. It is, of course, understood that the difference between the total output of 25,427,094 tons which was shipped from the Lake Superior mines during 1908, and the receipts of 20,414,491 tons at Lake Erie ports, is ore that went to places other than Lake Erie ports, such as the furnaces at Detroit and South Chicago. The accompanying table shows receipts at Lake Erie ports and amounts on dock during six years past:

IRON ORE RECEIPTS AT LAKE ERIE PORTS, GROSS TONS.

Ports.	1908.	1907.	1906.	1905.	1904.	1903.
Toledo	680,553	1,314,140	1,423,741	1,006,855	508,792	652,305
Sandusky	.....	83,043	35,847	51,202	48,356	130,532
Huron	213,377	971,430	778,453	825,278	231,364	486,106
Lorain	2,286,388	2,621,025	2,191,965	1,605,823	972,931	990,490
Cleveland	4,240,816	6,495,998	6,604,661	5,854,745	3,572,228	4,434,160
Fairport	1,518,961	2,437,649	1,861,498	2,008,621	1,157,858	1,434,342
Ashtabula	3,012,064	7,521,859	6,833,352	6,373,779	3,639,250	4,242,160
Conneaut	4,798,631	5,875,937	5,432,370	5,327,552	4,083,655	3,903,937
Erie	828,602	2,294,239	1,986,539	2,112,476	1,284,778	1,257,798
Buffalo & Tonawanda	2,835,099	5,580,438	4,928,331	3,774,928	2,433,601	2,194,901
Total	20,414,491	35,195,758	32,076,757	28,941,259	17,932,814	19,681,731

IRON ORE ON LAKE ERIE DOCKS, DEC. 1, GROSS TONS.

Ports.	1908.	1907.	1906.	1905.	1904.	1903.
Toledo	590,925	518,645	281,000	368,024	318,573	106,710
Sandusky	36,079	44,546	17,467	52,977	75,134	95,275
Huron	458,158	415,730	245,499	208,023	182,495	253,249
Lorain	426,274	366,271	336,321	271,695	299,504	288,581
Cleveland	1,458,392	1,281,335	1,224,606	1,330,619	1,237,033	1,337,750
Fairport	835,821	523,981	590,783	759,961	660,420	845,946
Ashtabula	2,293,531	2,056,820	1,631,312	1,589,951	1,403,575	1,911,911
Conneaut	1,296,675	1,090,774	1,057,424	976,976	684,487	591,364
Erie	730,530	652,219	552,631	564,961	583,439	657,409
Buffalo	315,148	435,407	315,412	315,780	318,739	282,890
Total	8,441,533	7,385,728	6,252,455	6,438,967	5,763,399	6,371,085

Recommend Capital Increase.—The directors of the Youngstown Sheet & Tube Co. recommend to a vote of the stockholders that the capital stock of the company be increased from $6,000,000 to $10,000,000. The improvements made within the past year, together with the additional construction already planned and the plant as it stood before, represent an investment of such magnitude that the increase is recommended to bring the capitalization nearer to the actual value of the plant. The new stock allotment will include $3,000,000 stock dividends and $1,000,000 cash.

The Texas state penitentiary board has declined to consider further the proposition of John L. Wortham to lease the blast furnace at the Rusk penitentiary. The governor announces that as soon as the state railroad shall be completed to Palestine, iron making at Rusk will be resumed.

MINERAL STATISTICS OF MISSOURI.

St. Louis, Dec. 28.—J. W. Marstellar, secretary of the state bureau of mines and mining, has transmitted to the governor the twenty-first annual report of that department. A summary of the minerals mined for last year is as follows:

Lead ore, 302,581.500 pounds, valued at $9,823,000; zinc ore, 450,783,000 pounds, value $9,056,965; coal, 8,710,988,000 pounds (355,494 tons), value $7,306,125; iron ore, 214,726,000 pounds, value $220,176; baryte, 120,741,000 pounds, $292,540; tripoli, 12,036,000 pounds, $48,144; copper valued at $70,180; cobalt valued at $5,462. The value of production for the year, $26,823,422.

The per cent of increased value during the last ten years is as follows: Lead, 427 per cent; zinc, 430 per cent; coal, 172 per cent. A total increase in the three minerals named for ten years, $19,923,086.

The total of $26,823,422 does not include the clays, marble, granite, building stone, cement and lime rock estimated by the United States geological survey at $6,862,000. It added makes a grand total of underground wealth for the year of $33,685,422.

Power Installation.—The C. & G. Cooper Co., Mt. Vernon, O., has taken the contract to build a 3,000-horsepower cross-compound Corliss steam engine, to be installed in the large new power house being erected by the Packard Motor Car Co., Detroit, Mich. The cylinder dimensions are 38 and 70 x 54 inches. The engine will be direct-connected to a 2,000-kilowatt Western Electric generator. Present power equipment will be moved into the new plant and when the installation is complete, the capacity will be about 3,000 kilowatts, comprising the largest installation in that part of the country. The new power house of the Packard company has been necessitated by larger power requirements for the works, a large addition being under way to accommodate the manufacture of motor trucks. The plant is expected to be in operation about April 1.

Dry Blast Installations.—The Hamilton Steel & Iron Co., Ltd., Hamilton, Ont., has taken a license to use the Gayley dry blast at its two blast furnaces and the construction of the plant will be undertaken at once. The dry blast plant will be built under the designs and supervision of Frank C. Roberts & Co., of Philadelphia. The same engineers have in charge the design and construction of the dry blast plant for the Pioneer Iron Co., at its Marquette furnace.

OBITUARIES.

Thomas P. Carlin, aged 54, for a number of years connected with various industrial plants in Pittsburg as a mechanical engineer, died recently in Los Angeles, Cal.

Thomas Holliday, president of the Holliday Mfg. & Engineering Co., Chicago, died Dec. 19, at his home in that city. He was born in Cumberland, England, in 1856, and came to Chicago in 1882.

Henry Aiken, who died of heart failure at his home in Pittsburg, Dec. 8, was a well known consulting engineer. Removing to Pittsburg in 1889 from Philadelphia, where he had first located upon coming to America from Ireland, he with Julian Kennedy engaged in the construction of the Homestead works. At the time of his death he was president of the Hydraulic Machine Co. He was the inventor of various labor saving devices, especially in use about blast furnaces and steel works. He was 66 years old.

Charles A. Brayton, president of the Standard Car Wheel Co., died Dec. 24, at his home in Cleveland, aged 66 years. Death was due to apoplexy, he being stricken more than a year ago, but he had since recovered sufficiently to have been upon the streets three weeks ago. He was a son of Dr. Brayton, of Painesville, O., and began his active business life in the employ of the Pittsburg & Cleveland railroad, becoming pay master, and later entering the purchasing department. He was a partner in the foundry firm of Maher & Brayton for 25 years until it was absorbed by the National Car Wheel Co., in 1896. He then founded the Standard Car Wheel Co., in company with his two sons, W. B. Brayton and C. A. Brayton Jr. Mr. Brayton was a charter member of the Union Club and prominently identified with Cleveland club life.

PERSONALS.

President E. C. Felton, of the Pennsylvania Steel Co., who has been in Cuba for several weeks, has returned to Philadelphia.

A. D. McAdam, formerly auditor of the American Car & Foundry Co. at Detroit, and later manager of sales of the Michigan Malleable Iron Co., has been elected vice president of the Damascus Brake Beam Co. and will devote his entire time to that company's interests after Dec. 31.

W. J. Davis, superintendent of the Peoria, Ill., division of the L. E. & W. railroad, has resigned and has accepted the office of general manager of the Mississippi Valley Iron & Furnace Co., St. Louis.

John H. Hannahan will shortly resign his office as grand master of the Brotherhood of Locomotive Firemen to become vice president of the American Automatic Stoker Co.

William A. Field, general manager of the Chicago plant of the Illinois Steel Co., was tendered an appreciative banquet by the officials and superintendents of the Illinois company at the Stratford Hotel.

W. S. McCombs, who has been furnace superintendent for 25 years at the plant of the Ohio Iron & Steel Co., Lowellville, O., has resigned. He will be succeeded Jan. 1 by Mark C. Steese, of the LaBelle Iron Works, Steubenville, O., formerly with the William Tod Co., and later with the Brier Hill Iron & Coal Co.

W. J. Parker, president of the Northern Colorado Power Co. and vice president of the Denver Gas & Electric Co., has been elected president of the Florence Iron Works, Florence, Colo.

C. S. Lovell, secretary of the E. H. Mumford Co., Philadelphia, manufacturer of molding machines, since its organization, has resigned to accept a position with Baxter D. Whitney & Son, Winchendon, Mass. He will be succeeded by E. M. Huggins, who has been chief draftsman of this concern since its organization.

Prospectors are endeavoring to locate further iron ore deposits in Berks county, Pa. One firm working on Furnace Hill, Earl township, has increased the number of its employes to 12. The Berks Development Co., 608 Chestnut street, Philadelphia, is conducting similar operations near Shanesville, as well as near Earlville.

The Cincinnati office of the Republic Iron & Steel Co., M. E. McKee sales manager, will move on Feb. 1, to new quarters on the thirteenth floor of the First National Bank building. A handsome corner suite of rooms is now being remodeled for the occupancy of the Cincinnati office.

The stack of the Warner Iron Co., at Cumberland Furnace, Tenn., will blow out on Dec. 24, for re-lining and repairs.

OPEN SHOP APPROVED

On the Pacific Coast—Dinner of United Metal Trades Association.

Pointed illustrations of the economy of modern foundry methods, an expression of entire satisfaction with the open shop policy and a plea for more liberal publicity in business and technical affairs were the keynotes of the discussion at the dinner of the Washington members of the United Metal Trades Association of the Pacific Coast, which was held at the New Washington hotel, Seattle, Tuesday evening, Dec. 22. The dinner was an informal gathering of the prominent foundrymen and machinery manufacturers of Washington and included delegates from Spokane, Walla Walla, Tacoma, Everett and Seattle. T. B. Sumner, president of the Sumner Iron Works, Everett, and also president of the United Metal Trades Association, presided during the discussion.

H. S. Hastings, commissioner of the association, read reports on the iron and steel industry of China, showing that extensive developments are going on in the far east which may possibly afford a solution of the Pacific coast's troublesome problem of getting suitable pig iron at a reasonable price.

George James, president of the Variety Iron Works, Seattle, gave some interesting examples of the possibilities of the jarring machine. Mr. James cited instances where 120 common grate bars were molded per day by machines at a greatly reduced cost. Hoisting engine drums formerly requiring four hours to mold by hand were produced in 20 minutes by machine. Such devices as jarring machines, declared Mr. James, make it possible for the manufacturer to rid himself forever of trades union domination.

Gilbert Hunt, president of the Gilbert Hunt Co., Walla Walla, Wash., gave an interesting history of the manufacture of harvesting machinery on the Pacific coast and pointed out how the coast manufacturer can meet eastern competition by building goods more closely adapted to local needs and of better quality.

Niven McConnell, president of the McConnell Engineering & Machinery Co., Tacoma, pointed out the significance of the fact that the strike of the iron molders in the northwest has not been officially declared off and that the men have stood out for 20 months. There must be no relaxation on the part of the employers.

J. M. Frink, president of the Washington Iron Works and the dean of the northwestern machinery manufacturers, said that for the first time in 27 years, due to open shop methods, he was making money in his foundry. Mr. Frink also thought that the Pacific coast could and would build up successful manufacturing industries along other lines as it has in the manufacture of lumber machinery.

J. V. Paterson, vice president of the Moran Co., Seattle, showed that shipbuilding on any large scale under present American conditions is impossible in this country. "Conditions in the American merchant marine are deplorable and growing worse. American ships are constantly being transferred to foreign flags."

J. T. Heffernan, president of the Heffernan Engine Works, Seattle, warmly seconded Mr. Paterson's remarks. Mr. Heffernan also made a strong plea for greater publicity on the part of manufacturers, saying that it was an essential part of a successful business. "Let the people know what we are doing," declared Mr. Heffernan.

John Hartman, manager of the Atlas Foundry Co., Tacoma, spoke of the progress in foundry practice in his lifetime and expressed the opinion that the Pacific coast could manufacture its own pig iron. "China may hold a solution of our pig iron problem, but it would be much preferable if we could solve it right here in the state of Washington."

At the conclusion of the discussion a committee on legislative affairs, to be headed by T. B. Sumner, was authorized, and a committee on trade schools consisting of Gilbert Hunt (chairman), H. S. Hastings and John Hartman, was appointed.

PIPE COMPANY CHANGES.

The controlling interest of the Glamorgan Pipe & Foundry Co., Lynchburg, Va., has passed into the hands of a new company whose officers are as follows: President, Walker Pettyjohn; vice president and general manager, A. M. Campbell; secretary and treasurer, Harry Campbell. The directors include O. B. Barker, John A. Craddock, John D. Horsely, R. D. Apperson, A. M. Campbell, N. D. Eller, S. E. Vaughn and Walker Pettyjohn, all of Lynchburg; J. I. Pritchett, Danville; A. J. McClure, M. J. Drummond of New York City. The offices of the company have been removed from Norfolk county to Lynchburg.

POWER DEVELOPMENTS

Figure Largely in the Machinery Market of Milwaukee.

Milwauke, Wis., Dec. 26.—Milwaukee machinery manufacturers say that one of the most encouraging features in connection with the present industrial revival is the relatively large number of power developments now being undertaken, not merely "projected," but actually brought to successful operation. Manufacturers say that orders are coming in fairly well and indicate that the coming year will be a successful one. Several large contracts have been placed recently with the Allis-Chalmers Co., and seem to indicate that affairs have taken a turn for the better. The Snow Mountain Power Co., of Eureka, Cal., has just placed an order with the Allis-Chalmers Co. for a 4,000-horsepower horizontal turbine. At Ocala, Fla., the Florida Power Co. will install in open flume two horizontal quadruplex turbines of 3,600 horsepower combined capacity.

The Wisconsin Engine Co., of Corliss, Wis., has just made shipment of a heavy duty Corliss engine to J. M. Kohler Sons Co., of Sheboygan, Wis. This engine will furnish the power for the electric-driven machinery at the Sheboygan plant, a center for the manufacture of sanitary appliances.

The Merchants' and Manufacturers' Association of Milwaukee will do all that it can to encourage the industrial extension work which is being carried on by the University of Wisconsin. Classes have been formed in many of the leading factories of the state during the past year and manufacturers have been well pleased with results and are doing much to encourage the movement.

Plans for a bascule bridge over the river at Sheboygan, Wis., are being drawn by the Milwaukee Bridge Co. It is estimated that the structure will cost from $75,000 to $90,000.

The Wisconsin Engine Co., of Corliss, Wis., has just contracted to furnish to the Allegheny Valley Street Railway Co., of Pittsburg, two horizontal cross compound Corliss engines to be connected to two 500 kilowatt generators. These engines have the unique feature of running 150 revolutions per minute, which is rendered practicable by the correct novel design of the Wisconsin valve gear.

Negotiations are under way with the Austin-Western Co., of Harvey, Ill., by the county board of Jefferson

county, Wis., for the purchase of extensive road machinery, including portable stone crusher, a motor-driven 10-ton roller, a steam grader, rooter, heavy plow and a steam shovel.

The machinery of the new municipal power plant at Jefferson, Wis., was started on Christmas day. The plant, in addition to furnishing a day and night circuit, provides motive power to many of the smaller industries of the city.

The electric light and power works commission at Shawano, Wis., has purchased a 200-kilowatt dynamo for the city power plant. The business has increased to the extent so that an additional 250-horsepower boiler will be added in the near future.

Plans are under way by the Felker Bros. Mfg. Co., of Sparta, Wis., manufacturer of metal goods, for the removal of the plant to Marshfield, Wis.

The Milwaukee Woven Wire Co., whose plant was practically destroyed by fire last fall, will rebuild at Thirtieth street and North avenue, where a $16,000 brick and stone structure will be erected.

DINNER TO MR. LAIDLAW.

A complimentary dinner was tendered to Walter Laidlaw of the Laidlaw-Dunn-Gordon plant of the International Steam Pump Co., Dec. 23, at Cincinnati. Mr. Laidlaw leaves the Cincinnati plant on the first of the year to go to Buffalo to take charge of the Snow & Holly plant of the same company. William Goodman, Mr. Laidlaw's chief assistant, will succeed him here. Mr. Laidlaw has been a resident of Cincinnati for many years, and has been connected with the plant which he is now leaving from its beginning. On Tuesday evening a group of his intimate friends and business acquaintances tendered him a farewell dinner at the Business Men's Club and presented him a handsome silver loving cup. William Lodge, of the Lodge & Shipley Machine Tool Co., acted as toast-master. Those present were Fred A. Geier and C. Wood Walter, of the Cincinnati Milling Machine Co.; William Lodge and Murray Shipley, of the Lodge & Shipley Machine Tool Co.; B. B. Quillan, of the Cincinnati Planer Co.; P. G. March, of the Cincinnati Shaper Co.; A. H. Tuechter, of the Cincinnati Machine Tool Co.; R. K. LeBlond, of the R. K. LeBlond Machine Tool Co.; L. P. Hazen, of the L. P. Hazen & Co.; John Neil, of the McGowan Pump Co.; Prof. John L. Shearer, of the Ohio Mechanics Institute; and H. M. Norris, of the Bickford Drill & Tool Co.

DEATH OF H. W. CALDWELL.

The death of Henry Wallace Caldwell, president of H. W. Caldwell & Son Co., engineer, founder and machinist, of Chicago, occurred Dec. 22 at Redlands, Cal. Mr. Caldwell had been an invalid for a number of years, and in the hope of improving his health, had taken up his residence in California.

He was born in Bath county, Ky., in 1843, and while attending college enlisted for service in the Union

HENRY W. CALDWELL.

army during the civil war, served in Kentucky and Tennessee and attained the rank of lieutenant. At the close of the war he removed to Indianapolis and for a number of years was superintendent of the Indiana State Board of Agriculture. Afterward he engaged in the management of grain elevators, and thus became interested in mechanical devices used in such plants. The transportation of the grain by means of conveyors drew his particular attention and he turned his efforts toward the improvement of the screw or spiral conveyor, then a very crude device usually manufactured by the millwright equipping the elevator.

Mr. Caldwell patented and began the manufacture of the Caldwell conveyor, and for 33 years his name had been associated with this special type of conveying apparatus. Moving from Indianapolis to St. Louis in 1876, he engaged in the building of grain elevators while continuing the manufacture and sale of the screw conveyor. The elevator contracting department was discontinued, and from then on Mr. Caldwell gave his entire attention to the manufacture of elevator machinery. In 1881 he removed to Chicago, and the business has been one of satisfactory growth ever since. In 1892 the business was incorporated, his sons Frank G. and Oliver N. Caldwell being associated with him. Mr. Caldwell was married in 1865, and the death of his wife occurred eight years ago. Two daughters beside the sons mentioned survive. His long continued connection with the manufacture of machinery and the large proportions which the business has attained made him a prominent figure in the machinery world.

RECENT CUSTOMS DECISIONS.

The board of general appraisers also held in protests of M. J. Corbett & Co. and Chas. Dien, New York, that steel rivets are dutiable as "rivets of steel" under paragraph 167 of tariff act and not at 45 per cent under paragraph 193, as assessed.

Steel plates with one side checkered to prevent slipping and used as flooring in boiler rooms were assessed with duty at six-tenths of one cent per pound under paragraph 126 for "plate steel," and claimed dutiable at four-tenths of one cent per pound under paragraph 135 for "steel plates, not specially provided for," in protests of R. D. Wood & Co., Philadelphia. The board of general appraisers held in earlier protests that merchandise of the same character was dutiable as claimed. This ruling the United States court of appeals, Third district, affirmed and the treasury department acquiesced in, so the board sustained the protests now in litigation.

The Hartman-Nelson Machine Co., Green Bay, Wis., is enlarging the partnership to include Oscar Zapfe, and the firm will hereafter be known as the Hartman, Nelson, Zapfe Co. Mr. Zapfe was a foreman in the shops of the Duluth, South Shore & Atlantic railroad at Marquette, Mich. The company will occupy the Straubel machine shops adjoining, and will add to the machine shop work boiler, structural and sheet metal construction.

BAR PRICES

Readjusted on the Pacific Coast—Tin Plate for Salmon Packers.

Office of THE IRON TRADE REVIEW,
302 Pioneer Bldg., Seattle, Wash., Dec. 26.

A free movement of tin plate for the Alaska salmon-can factories and a further readjustment of the prices of bar iron and mild steel in the San Francisco district have formed the chief features of interest in iron trade circles on the Pacific coast during the past week. The Alaska canneries represent half of the salmon pack, their output in 1907 being 2,292,071 cases requiring 11,460 tons of tin plate for the cans. This pack varies very little from one season to another and Alaska can interests are now specifying freely for their spring requirements of tin plate, which will be fully 11,000 tons.

The San Francisco interests dealing in bar iron and mild steel have decided to maintain a constant differential of $4 a ton between common iron and mild steel bars and have advanced their prices on both products. Bar iron is now $2.15, base, per 100 pounds, and mild steel is $2.35. Corresponding Seattle prices are $2.25 and $2.35. North coast interests have been asked to maintain the same differential as has been established in California. While there will very likely be a readjustment of prices on the north coast soon after Jan. 1, it has not been decided whether to establish the $4 differential between common iron and mild steel or not.

It has been decided to add three stories to the Leary building now under construction at Second avenue and Madison street, Seattle, making nine in all. The frame requires 1,600 tons of steel which is being supplied by the American Bridge Co.

Hoquiam, Wash., will build a new steel bridge across the Hoquiam river, consisting of three spans, two fixed and a draw span. The fixed spans will be 150 and 240 feet respectively, and the draw span 180 feet. The city engineer advises that the detail plans are yet to be worked out and the contract will probably be let in the early spring.

The Seattle Ice Co. will expend $150,000 on machinery for a new plant to be erected in the near future on the Seattle tide flats. The building will cost $100,000 and the plant will have a capacity of 150 tons daily.

The Washington Iron Works, Seattle, is completing the foundations for a new boiler shop and is making extensive improvements in its foundry. This firm is the largest manufacturer of logging engines on the Pacific coast and reports a very satisfactory volume of business; the plant is running full time and is behind in its deliveries.

An eight hour bill, which will include in its scope the employes of foundries and machine shops, will be introduced at the coming session of the Washington state legislature. The manufacturers claim that at present the wages paid on the Pacific coast are so high as to make competition with the east exceedingly difficult and that additional burdens would be unbearable. The employers will organize to fight the measure. It is also probable that a bill will be introduced to compel the weekly payment of wages. Most Pacific coast firms now pay monthly or every two weeks.

Using Ferro-Tungsten.—There was an interesting addition to a lecture on "A Simplified Diagram to Facilitate the Setting of the Various Valves of Internal Combustion Engines," by George Rodger, before the Sheffield (England) Society of Engineers and Metallurgists, at an informal meeting on Thursday, Dec. 3. F. C. Moorwood, exhibiting a number of ferro alloys used in the production of special steels, more particularly those which have recently been produced as "deoxidizers," indicated the advantages of using ferro-tungsten instead of the metallic powder generally in use at Sheffield. Tungsten alloys were used to remove suspended slag and oxides in the steel, but all led up to the final solution of this important question which seemed to rest with the electric furnace.

At the annual meeting of the stockholders of the Connellsville Machine & Car Co., Connellsville, Pa., the following directors were elected: James McGrath, Charles Davidson, W. E. Crow, W. F. Soisson, J. W. Ralston, Dr. L. P. McCormick and Chas. F. Hood. The officers for the new year chosen are James McGrath, president; Charles Davidson, vice president and J. W. Ralston, secretary and treasurer.

At the last meeting of the Boston school committee a communication from the central labor union requesting that union labels be placed on all school books was read and was promptly voted down on the ground that the corporation counsel had previously advised the committee to refuse all such communications.

INDIANA SHIPPERS

Ask Legislature to Place all Public Utilities Under Railroad Commission.

Indianapolis, Dec. 23.—At the annual meeting of the Indiana Manufacturers' and Shippers' Association a strong resolution was adopted in favor of placing all public utilities under the jurisdiction of the Indiana Railroad Commission with power to fix and adjust rates. The association appointed a committee to draft a bill and this will be presented to the Indiana legislature when it meets next month.

W. P. Jungclaus & Co. have the contract for a four story bakery building for the Taggart Baking Co., in which there will be considerable steel construction. Alexander Taggart is president of the company.

The Crecent Machine & Tool Co. has been placed in the hands of Frank H. Ewers, receiver, who was appointed recently by the circuit court. Receivership proceedings were brought by the Taylor Belting Co., on an account of $42.50. It is understood the machine company favored the appointment of a receiver.

T. J. Shanahan, W. S. Long and L. D. Hall have organized the Industrial Manufacturing Co. and will establish a plant at Elkhart for the manufacture of gasoline engines and other machinery and parts especially adapted to the use of farmers. The company has $10,000 capital.

Fred W. Payne of Auburn has sold his interest in the Auburn Foundry Co. of that city to his partner, Frank A. Borst, and will go to Chicago to assume the management of the National Trade Show Co. He has been vice president of the latter company for some time.

Farming implements and machinery are to be manufactured by the Morris Mfg. Co., which was organized here recently by William W. Morris, L. L. Guimmell and William D. Suit, with $50,000 capital stock. The company expects to begin business immediately.

R. M. Hutchinson, owner of the Morton Place garage, here, announces that he will engage in the manufacture of automobile trucks and delivery wagons as soon as he can purchase the necessary machinery and make other arrangements. He expects to manufacture a line of light trucks and wagons selling at from $800 to $1,000.

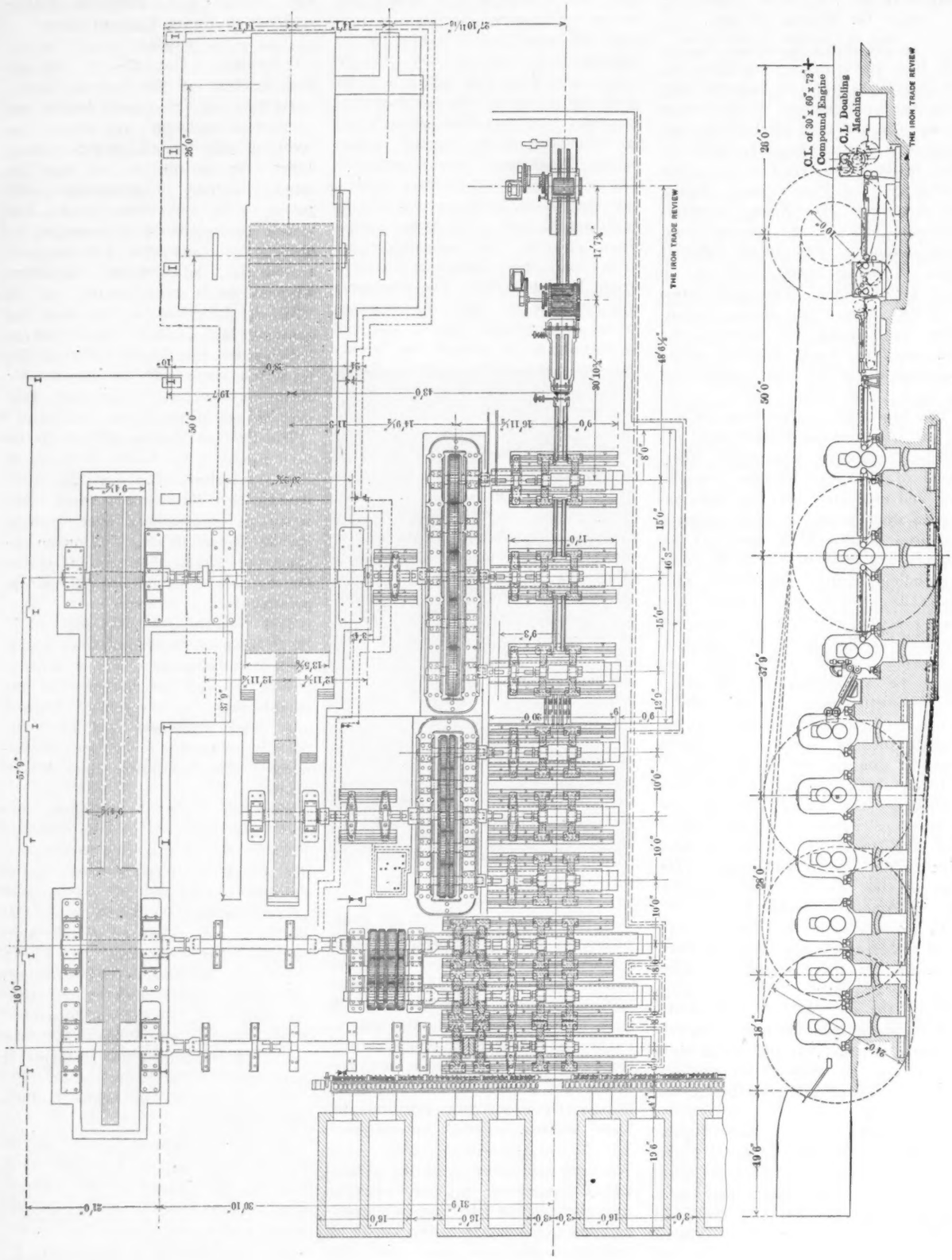


FIG. 1—PLAN VIEW AND END ELEVATION OF BRAY CONTINUOUS SHEET MILL.

THE BRAY CONTINUOUS SHEET MILL

Rolling Mill of the American Sheet & Tin Plate Co., Located at the Mercer Works, South Sharon, Pa.

The Bray continuous sheet mill, which is illustrated herewith, was installed in 1906 in the Mercer works of the American Sheet & Tin Plate Co., South Sharon, Pa. In this mill sheet bars are fed through at the rate of about 16 per minute, and the output is approximately 150 gross tons in 24 hours, the sheets being reduced to about No. 18 gage in the continuous mill, and are finished in single stands of rolls in the regular manner. The mill consists of four double continuous pair heating furnaces, and nine sets of sheet rolls, all driven by one 30 x 60 x 72-inch cross compound engine. The general arrangement of the mill is shown in Fig. I.

Heating Furnaces.

The sheet bars are received at the plant cut to the desired length, being unloaded from the cars and stored by cranes. They are likewise delivered onto a platform in the rear of the continuous furnace shown in Fig. 2 by an overhead crane. The bars are piled in twos and threes, depending upon the number of sheets that are to form the pack, and are placed on guides in the rear of the furnaces. These furnaces are provided with two chambers, each chamber having two water-cooled pipes carrying corrugated tile. In the operation of the furnaces these pipes are raised, carried forward and lowered, and the groups of bars are carried forward step by step in the furnace, the ends of the bars resting on the brick side walls of the furnace. At each step forward one group of bars is delivered from the front of the furnace onto a roller table, the bars being piled two and three high and are consequently uniformly heated. The furnaces are operated by a motor and stop device, whereby they are operated successively one after another at the rate at which the bars are required for the mill. The furnaces are fired by producer gas.

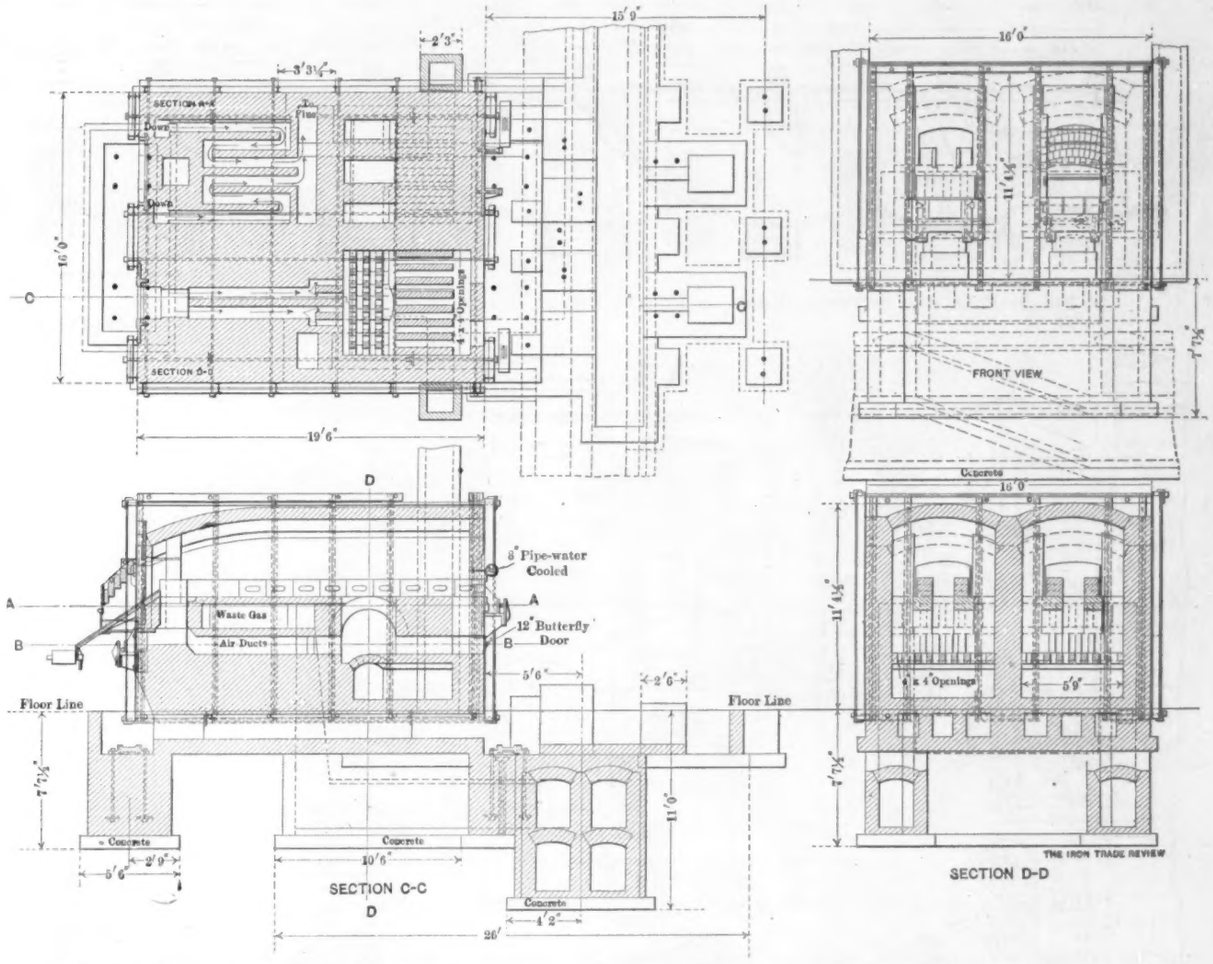


FIG. 2—PLAN AND SECTIONAL VIEWS OF CONTINUOUS HEATING FURNACE, BRAY CONTINUOUS SHEET MILL.

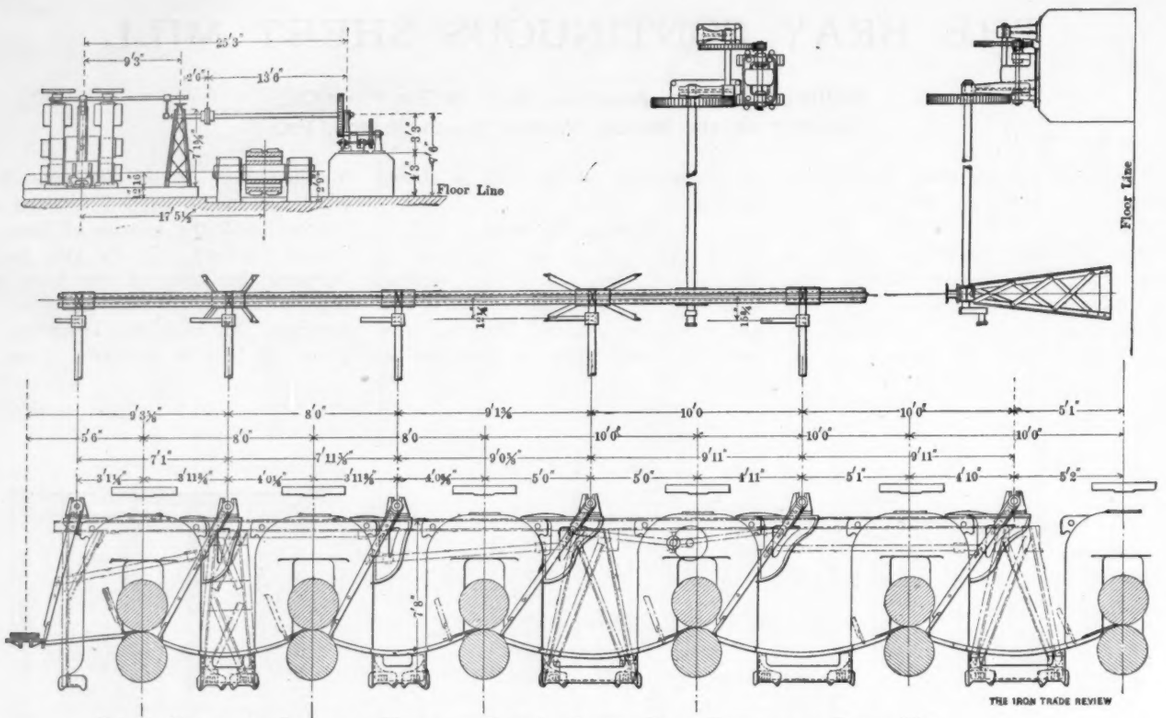


FIG. 3—PLAN AND SECTIONAL VIEWS OF FEEDING DEVICE, BRAY CONTINUOUS SHEET MILL.

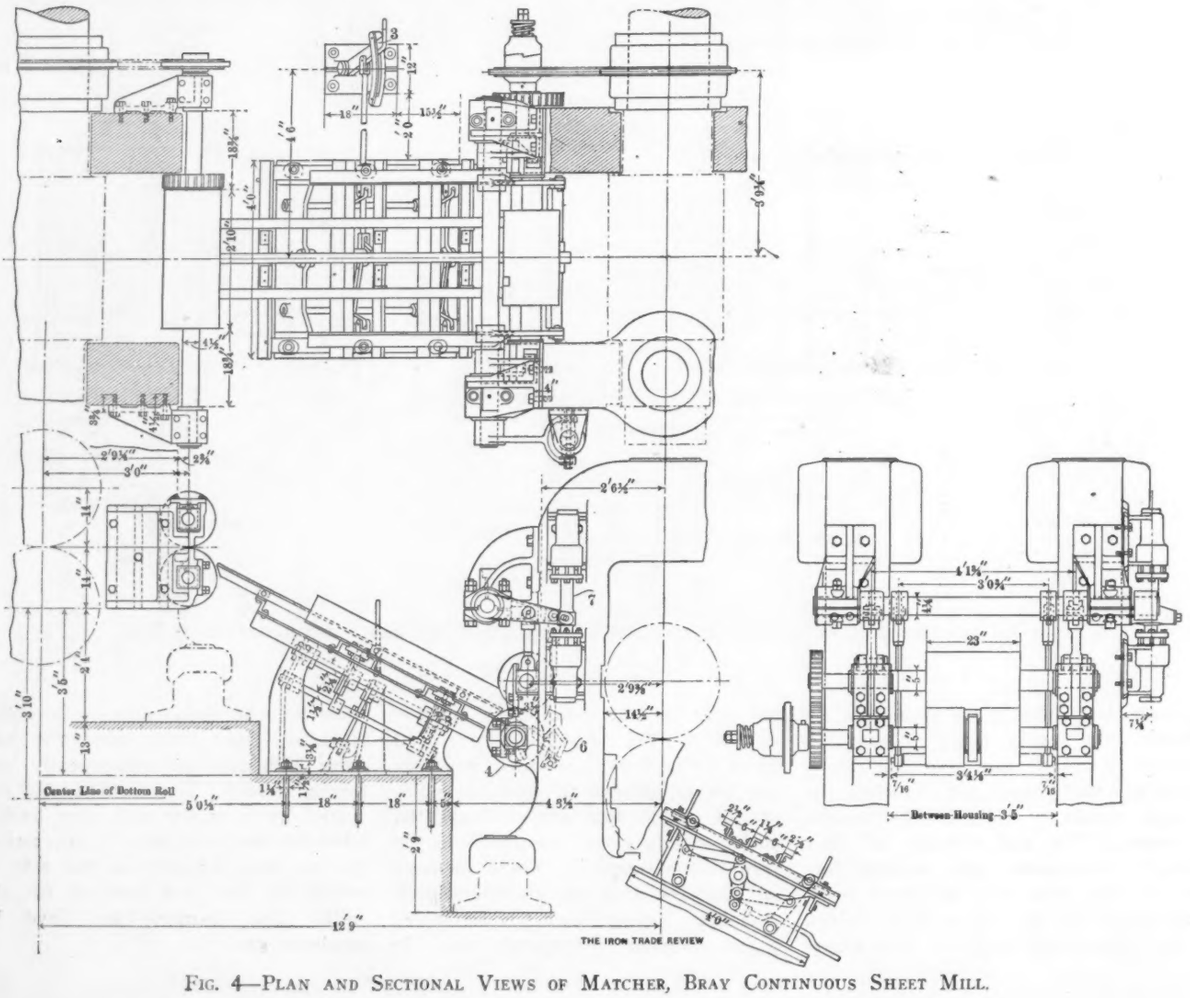


FIG. 4—PLAN AND SECTIONAL VIEWS OF MATCHER, BRAY CONTINUOUS SHEET MILL.

The roller tables in front of the furnaces operate continuously and feed the bars toward the center in front of the first set of reducing rolls. At this point a workman starts the bars singly and successively into the first set of rolls, after which the bars are taken care of automatically.

Feeding Device.

The device used for feeding the bars through the first group of six rolls is shown in Fig. 3. Depending swinging arms are employed, together with stationary tables, and on the bottom of these arms are swinging fingers. There are two arms in front of each set of rolls. As the bar emerges from the first set of rolls onto an inclined stationary table, the reciprocating arms returning pass over this bar, the swinging fingers permitting the arms to pass over the bars without disturbing them. In their forward movement, the two arms engage the rear of the bar and feed it forward squarely into the next set of reducing rolls. This arrangement is necessary as in a mill of this kind it is essential that the bars enter the rolls absolutely square. Chain tables are not desirable for the reason that the bar is of such short length that side guides would not necessarily guide the bar perfectly square with respect to the table, and the bar might possibly enter the next set of reducing rolls at an angle. After the bar has been elongated to a considerable extent, chain tables are desirable and are used.

Matching Device.

As shown in Fig. 1, the bars pass singly through the first group of six pairs of reducing rolls. After emerging from the last pass, the bars slide down onto an inclined table into a matcher, shown in Fig. 4, the front edges being held at the lower end by means of a stop. The general practice is to match in threes, and consequently plates pile up on one another in this matcher, the front edge of the plate coming against the stop. This is shown in its lowered or inoperative position, but is normally held in the upper position, and the plates coming against this stop pass between a set of positively-driven feed rollers, which are opened when the stop is raised to permit the plates to pass between them.

Squaring Device.

After two or three plates have been piled on top of each other on the inclined table, and are against the stop, the pack is squared by reciprocating side guides operating through a link mechanism. The entire device is controlled by means of a lever. Holding the side guides in this position, the operator lowers the stop by means of hydraulic cylinders, at the same time lowering the positively-driven feed rollers, and the pack thus held together by these feed rollers is fed forward into the next set of reducing rolls. The feed roll is then raised, and the side guides are open ready for the next cycle of operations. The pack thus formed is carried forward through three sets of reducing rolls provided with intermediate chain tables. After leaving the last set of reducing rolls the

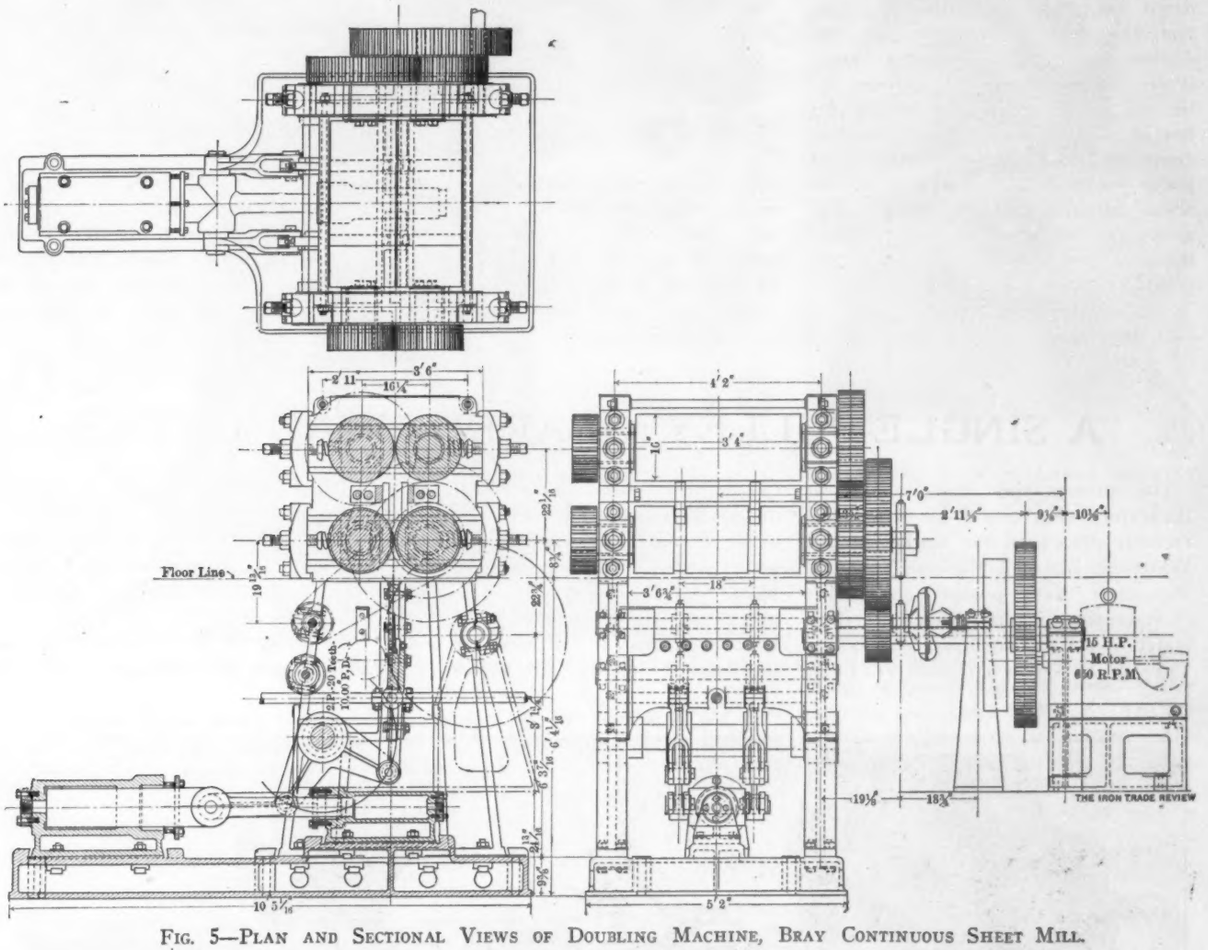


FIG. 5—PLAN AND SECTIONAL VIEWS OF DOUBLING MACHINE, BRAY CONTINUOUS SHEET MILL.

pack is passed through a water bosh which suddenly chills and contracts the metal, and from this point it passes to an opening machine, where the sheets are loosened. From this machine the plate is carried forward on chain tables to a roll doubler, shown in Fig. 5.

The Doubler.

The pack is brought to a central position under the rolls of this doubler by means of centering devices, and a plunger then feeds the center of the pack up into the bite of the doubling rolls. The plunger then drops back into its normal position, and the pack is fed through the doubler onto a delivery table, which is not shown. From this delivery table the plates are automatically delivered under an overhead traveling crane of small capacity, where the packs are carried to the rear of the sheet furnaces for reheating. The packs are fed into the rear of these furnaces and are drawn from the front by hand.

Finishing Stands.

In this plant there are five sets of finishing rolls, and the operation of finishing the product is the same as in the regular methods generally employed. As shown in Fig. 1, the mills are driven by a rope drive and gears, the rolls operating at about 28 revolutions per minute. Owing to the weights of the bars from which sheets are made, it was found desirable to have the first three sets of rolls in the roughing train balanced mills, the top rolls being driven through pinions, as shown.

Uniform Operations.

In the operation of this mill it is desirable and essential to maintain uniform and regular operations, so as to maintain to the highest possible degree the proper contour of the rolls. For this reason the mill was heavily constructed throughout to withstand shocks and strains, and the rolls in use are 28 inches in diameter with 22-inch necks. In ordinary sheet mill practice the rolls in use are 26 inches in diameter with 20-inch necks.

Removal of Broken Rolls.

The first mill, after the pack is formed, is subjected to severe strains and some trouble was experienced from roll breakage on this particular stand. A cast steel housing is now used provided with open windows, which permits the rolls to be removed through the window instead of having to separate the housing as is customary in mills of this character. To handle these rolls to the best advantage they are picked up on the end of a gooseneck, the end of which fits closely over the wabbler of the roll. In this way two rolls can be easily and quickly removed by means of the gooseneck and an overhead traveling crane, new rolls set in position and rolling continued.

Owing to the rapidity of the rolling operation it is possible to secure a greater reduction from the first heating than is possible in the regular method of rolling sheets, and the advantages secured by the use of this mill include not only an increased output, but a lower labor cost.

A SINGLE-PULLEY, GEARED HEAD LATHE

The accompanying illustration shows the features of a new single pulley lathe recently placed on the market by the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., possessing a number of interesting features, which are illustrated in the accompanying engravings. The same horsepower is delivered to the spindle of the lathe through all changes of spindle speeds. The lathe never has to be slowed down, in order to make any change, either in the speeds or feeds. All changes can be made, even by an unskilled operator, while the lathe is running at full speed or under the heaviest cuts.

Power is delivered to the machine, primarily, to the single pulley on the top shaft, shown in Fig. 4, and thence through a gear train and friction clutches, as shown in Fig. 5 and in detail in Fig. 6.

Referring to Fig. 5, power is transmitted from the pulley, shaft B by four

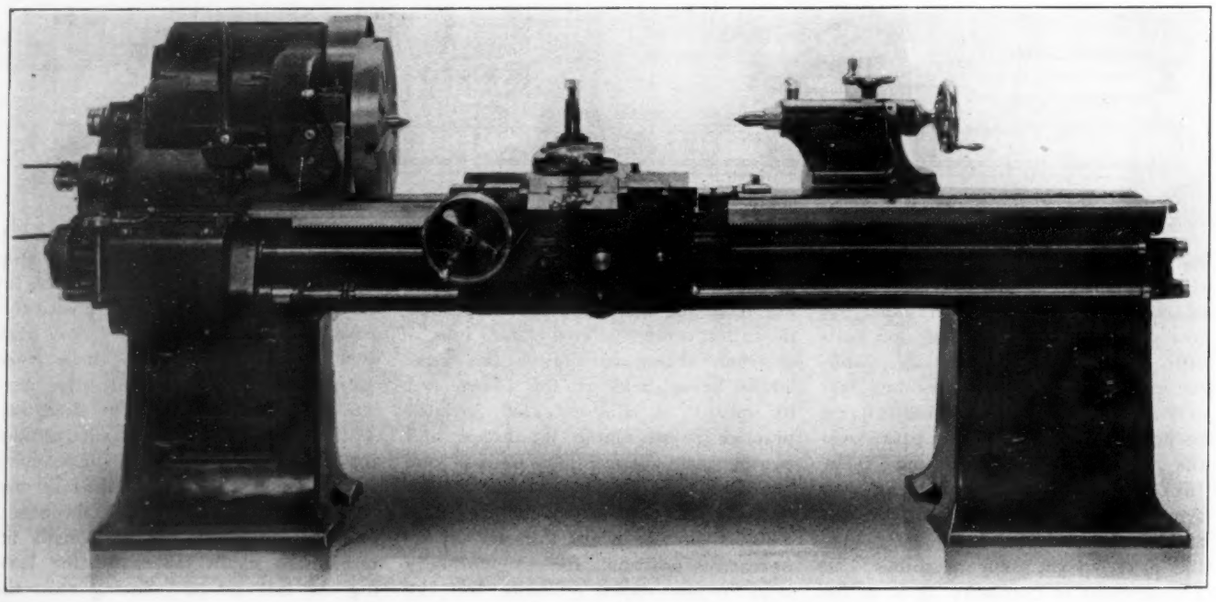


FIG. 1—WHITCOMB-BLAISDELL SINGLE PULLEY LATHE.

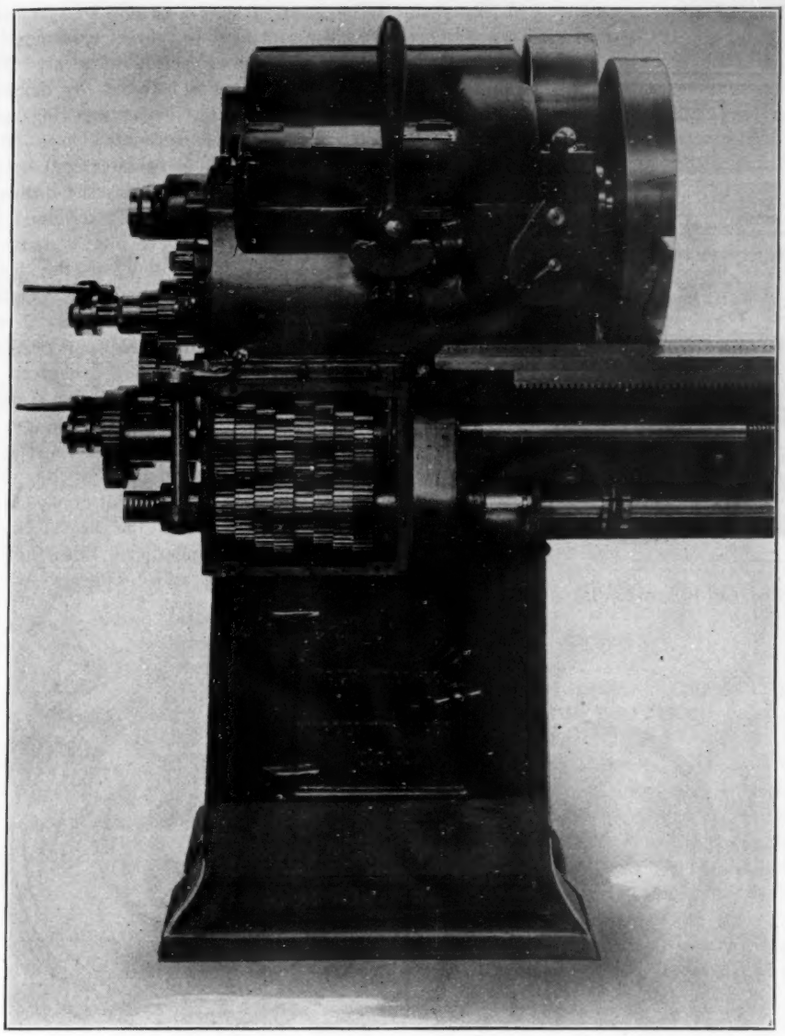


FIG. 2—FEED CHANGE GEARS ON WHITCOMB-BLAISDELL SINGLE PULLEY LATHE.

sets of friction driven gears, *a-a'*, *b-b'*, *c-c'* and *d-d'*, and from these to the main spindle C, by means of two sets of friction driven gears, *e-e'* and *f-f'*. From these gears motion is transmitted to the feed by the gear *g* on the rear end of the spindle, through the ordinary rocker plate, shown in Fig. 7 to the gear *h* on the upper feed stud D.

The end feed, shown in Fig. 8, consists of a compact gear train, whereby four speed ratios are delivered to the shaft G in the feed box. Thence by means of a double nest of gears operated by interlocking keys, as shown in Fig. 7, motion is delivered either to the

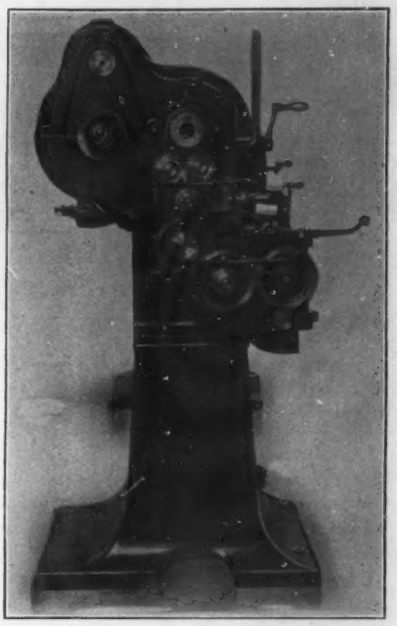


FIG. 3—END VIEW OF LATHE SHOWING FEED GEARS.

lead screw or to the feed rod, as desired.

Considering once more the details of the drive, the chief feature is the patented cushioned clutches used in this machine, and shown in Fig. 6. The action of this clutch is as follows: The large gear *f'*, shown in Fig. 5, carries the friction ring *i* by means of the pin *l*. The friction ring is provided with a

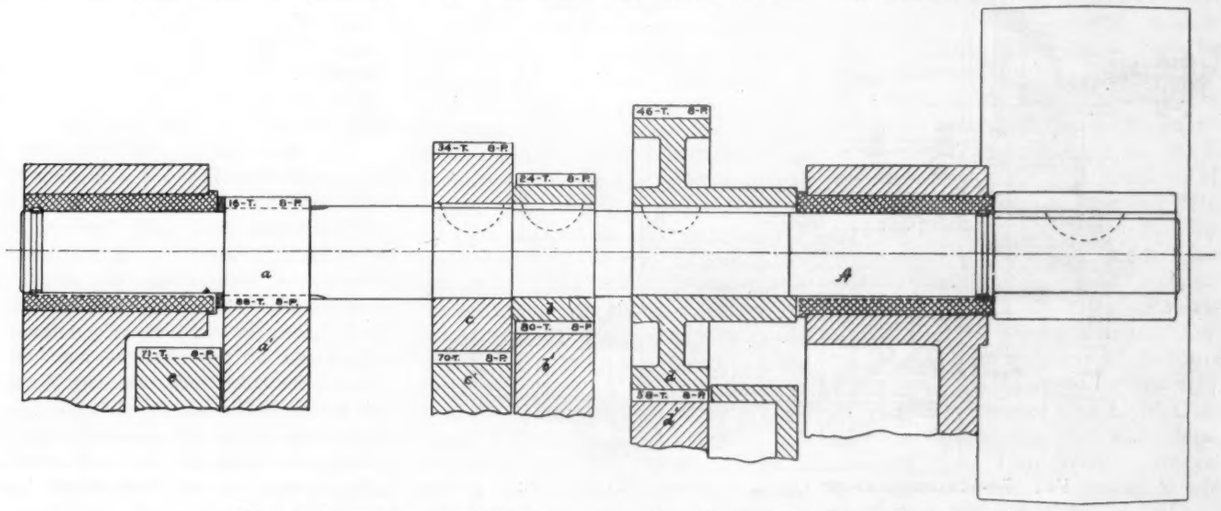


FIG. 4—PULLEY SHAFT FOR WHITCOMB-BLAISDELL GEARED HEAD LATHE ASSEMBLED.

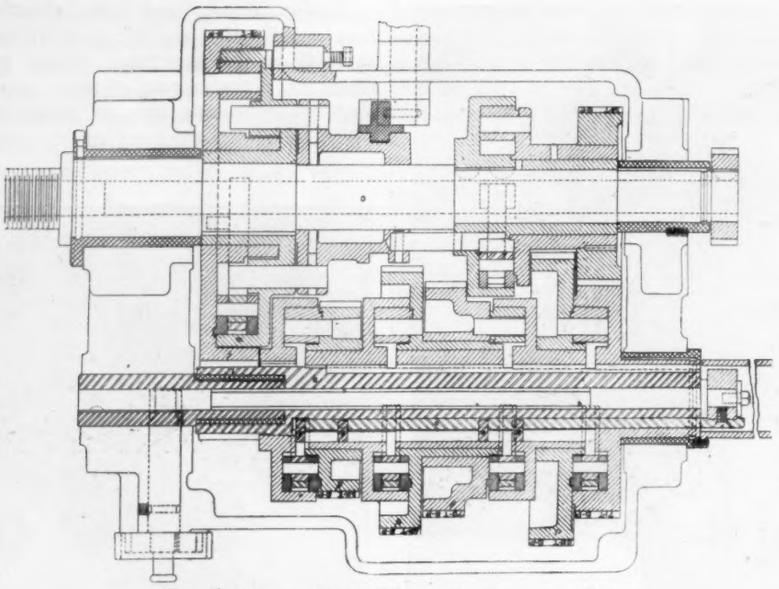


FIG. 5—GEARED HEAD WHITCOMB-BLAISDELL LATHE.

lever *j*, which has a cam shaped inner bearing surface. The operating pin *k* slides through a hole in the friction casing *m*, which is keyed to the spindle C. The function of this pin is to present an obstacle to the path of the lever *j*, and when in the operating position causes this lever to move out and to expand the friction ring against the friction casing *m* with whatever force the work requires.

When the friction ring is sufficiently expanded in this manner, the gear *f'* is locked to the friction casing and to the spindle sufficiently tight to drive the machine. The friction lever *j* is so proportioned as to have a surplus of operating range sufficient to cover extremes of load and a long period of wear. The essential difference between this friction and others of the expanding ring type is that the one considered here is a positive lock and is operated and determined by the load, whereas the ordinary types have their setting determined by an arbitrary adjustment and pressure.

The above description of the large friction clutch on spindle C applies equally to the smaller clutch also shown on this spindle and to the four frictions shown on shaft B, which are given in detail in the smaller view in Fig. 6, with the exception that in place of the pin *k*, those on shaft B used the cam shaped keys *k'* which are mounted on the slide *n* and operated by the small crank shown at the right end of the headstock in Figs. 1 and 8. Underneath this crank is placed a pointer, which indicates which of the four clutches on shaft B is in operation.

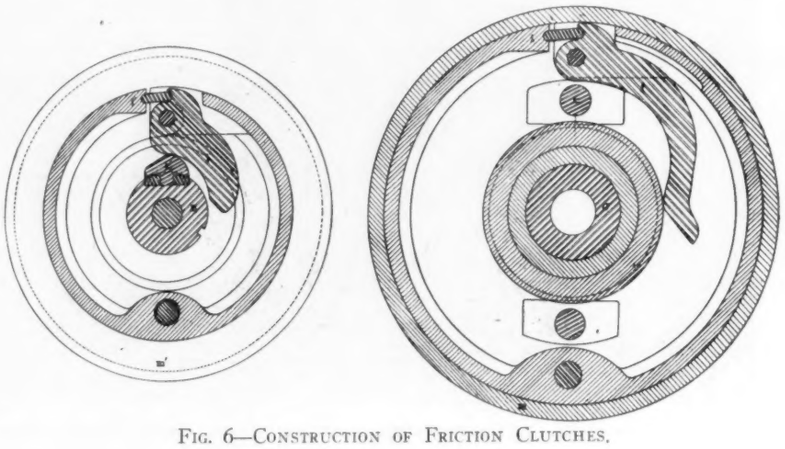


FIG. 6—CONSTRUCTION OF FRICTION CLUTCHES.

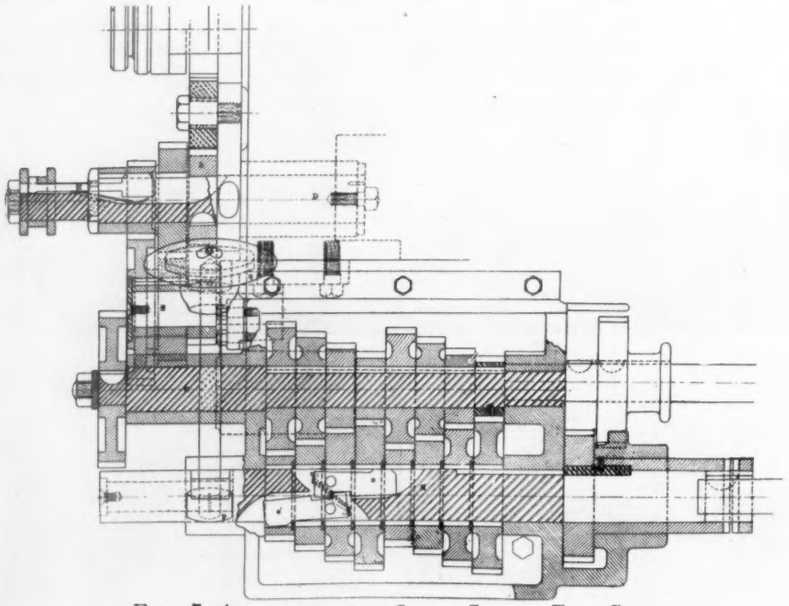


FIG. 7—ARRANGEMENT OF QUICK CHANGE FEED GEARING.

The two frictions on spindle C are governed by the pins *k'* and are operated by the lever which stands in an intermediate position to the left of this crank in Figs. 1 and 2. This lever when thrown to the right engages four slow speed series, and when thrown to the left engages four high speed series.

The operation of the end feed is shown in Figs. 7 and 8. By means of this feed four rates of feed are transmitted to the shaft G of the feed box. This latter, shown in Fig. 7, is composed of two nests of gears of eight each, operated by twin keys *o-o*, milled into the shaft H. Upon the left hand end of this shaft is mounted a sleeve, in which rack teeth are formed. A pinion, shown at *p*, meshes with these teeth and operates the keys by means of the inclined shaft and the hand wheel *q*. An indicator on this hand wheel shows

which gears in the nests are engaged by the keys. This in combination with the various positions of the keys in the shafts D and F determine the screw pitches and ratios of feed. The novel feature of the twin keys in shaft H is that the spring pressure tending to force

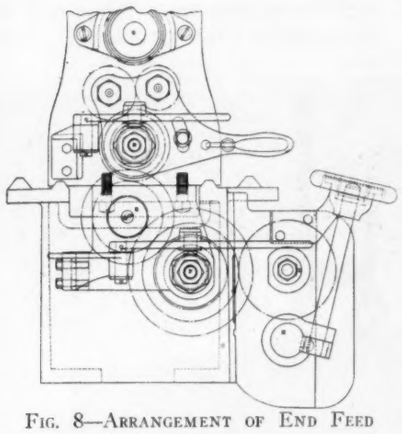


FIG. 8—ARRANGEMENT OF END FEED GEARS.

the inoperative key against the separating ring is entirely prevented by the interlocking of these at *r*.

The tailstock is provided with a patent clamp by means of which it is securely bound to the bed simultaneously at all

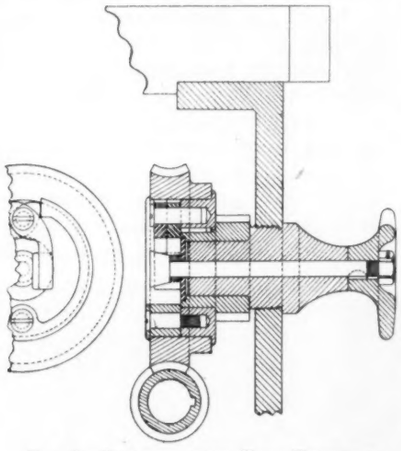


FIG. 9—LONGITUDINAL FEED FRICTION.

four corners by means of compound levers operated by a vertical hand wheel at the top. The longitudinal feed friction, Fig. 9, is adjusted by means of a taper cam operating the levers, which expand the ring within the worm gear. This may be adjusted by means of the nut *s* on the outside of the apron. The thread indicator, Fig. 10, is a simple device attached to the right of the carriage which permits of disengaging the lead screw nut when the carriage is run back to the starting point, and of re-engaging the screw, so that the tool will be in the correct position to resume work. The dial plate shown in the plan, Fig. 12, is driven at the proper rate of speed by the worm gear and train. All the gearing in the head of the machine runs in a deep pan of oil

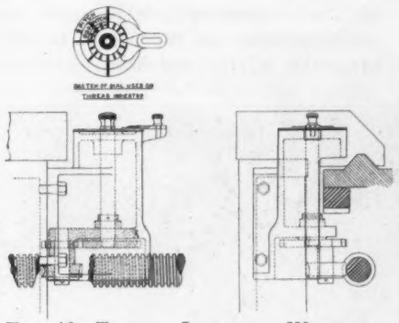


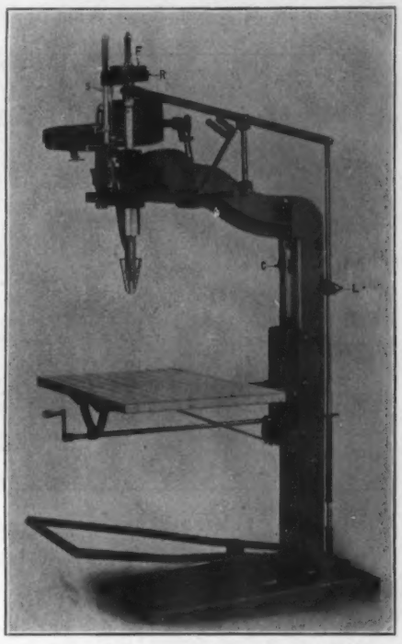
FIG. 10—THREAD INDICATOR WHITCOMB-BLAISDELL LATHE.

and requires no attention whatever for a long period of continuous operation, except to refill the pan.

A NEW LARGE CAPACITY SCREW DRIVING MACHINE.

The machine illustrated herewith is a large and improved screw driving machine. The machine has a capacity to set screws to the center of a 48-inch circle and the table has sufficient vertical adjustment to take in work 30 inches high. The table is automatically raised to clamp the work together, at the moment the screw is started by means of a cam C operated by a lever L extended through the column and connected to the vertical rod, which connects the foot-treadle and spindle, operating at the top of the machine. There is spring support for the table, which yields if an unusually thick piece of work is being operated on. The treadle by which the machine is operated is bowed outward, so that the operator may stand in front or at the side, as may be most convenient.

In addition to the usual features of magazine feed, adjustable friction drive to the spindle, the machine has a positive stop for the spindle, so that screws may be merely started or set so that the heads project to a uniform height if desired. This is accomplished by extending the driven friction flange F outwardly so as to extend over the driving flange and forming a male cone clutch surface on its periphery. A ring R, concentric with the spindle, and having a corresponding female cone surface, is arranged to slide freely vertically on a rod S, being carried upward by the arm which operates the escapement cams and following the arm downward until arrested by the collar T, which is adjustable on the rod. The spindle continuing downward, the clutch surfaces engage, arresting the rotary motion of the bit, the friction flanges which drive the bit being at the same



REYNOLDS AUTOMATIC SCREW DRIVING MACHINE.

time slightly separated to prevent undue wear. This is the latest and largest size of automatic screw driving machine built by the Reynolds Machine Co., Rock Island, Ill. The first machine was built for the United States arsenal at Rock Island.

Corry Manufacturers Organize:—The manufacturers of Corry, Pa., have organized the Manufacturers' Association of Corry, Pennsylvania, electing the following officers: President, F. E. Whittlesey, secretary, Raymond Mfg. Co.; first vice president, J. B. Patterson, secretary and manager K. P. L. Furniture Co.; second vice president, M. M. Raymond, president Raymond Mfg. Co.; third vice president, John H. King, manager Corry Chair Co.; secretary and treasurer, Arthur J. Lyons, secretary and manager U. S. Chair Co.; Assistant secretary, J. P. Drown, secretary Corry Business Men's Exchange; executive committee, J. J. Desmond, treasurer, J. W. and A. P. Howard Co.; L. W. Olds, president Climax Mfg. Co.; F. L. Bliss, president Ajax Iron Works. Officers have been established in rooms 10 and 12, Traction building, Corry.

A UNIVERSAL MICROMETER AND SURFACE GAGE.

The accompanying illustrations show in various positions a universal micrometer and surface gage developed by the Schellenbach-Hunt Tool Co., Cincinnati. Fig. 1 shows the bar of the micrometer held in the base clamp to be used as a bench instrument. In this position any measurement from 0 to 7 inches can be taken. The bar can be shifted endwise to any desired position in the base clamp and by a quarter turn backward the instrument can be lifted out of the clamp and placed in position to permit the sliding head to be moved to the desired unit on the bar as indicated by the figures. As shown in Fig. 1 the instrument to be used in the hand will measure round work to 4 inches in diameter and flat work up to 7 inches to 0.001 inch.

The bar of the instrument is flattened on one side as shown and the inch positions are determined by conical holes in the center of this flat. To set the measuring head to the required position on the bar, it is only necessary to slide the head to an approximate position as indicated by the figures and screw the locating pin down until its end seats itself in the hole in the bar. This operation positions the head accurately on the bar and clamps it rigidly at the same time. The bar as well as the locating pin and the bushing which guides it are hardened, ground and lapped.

Fig. 2 shows the instrument with the anvil head removed, and the bar and micrometer head in position over the base anvil with a 2-inch disc between the measuring surfaces. From 0 to 7 inches can be measured in this manner. The distance from the bottom of the base to the anvil is one inch. With the head positioned to the second hole of the bar 0 to 1 inch can be measured. The bar is drawn to its seat in the base by the same screw used in connection with the anvil head. Fig. 3 shows the instrument with the bar given a half turn in the base and the head positioned to the seventh hole in the bar measuring a 6-inch height block. In this position any distance from 0 to 8 inches can be measured. Cast iron height blocks as illustrated 6 and 12 inches high can be furnished. With these the instrument has a measuring range of 26

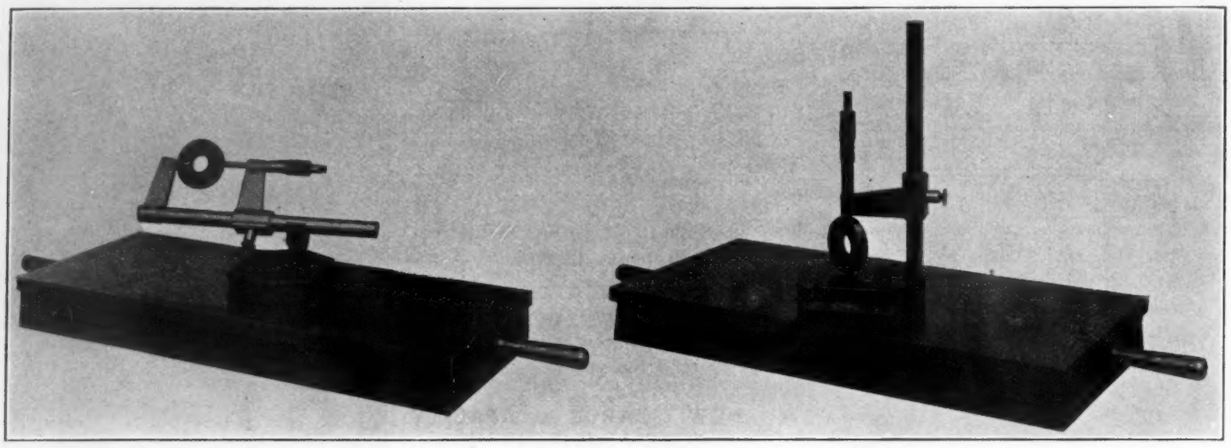


FIG. 1—INSTRUMENT READY FOR USE AS A BENCH MICROMETER.

FIG. 2—ANVIL HEAD REMOVED AND INSTRUMENT IN USE WITH A BASE ANVIL.

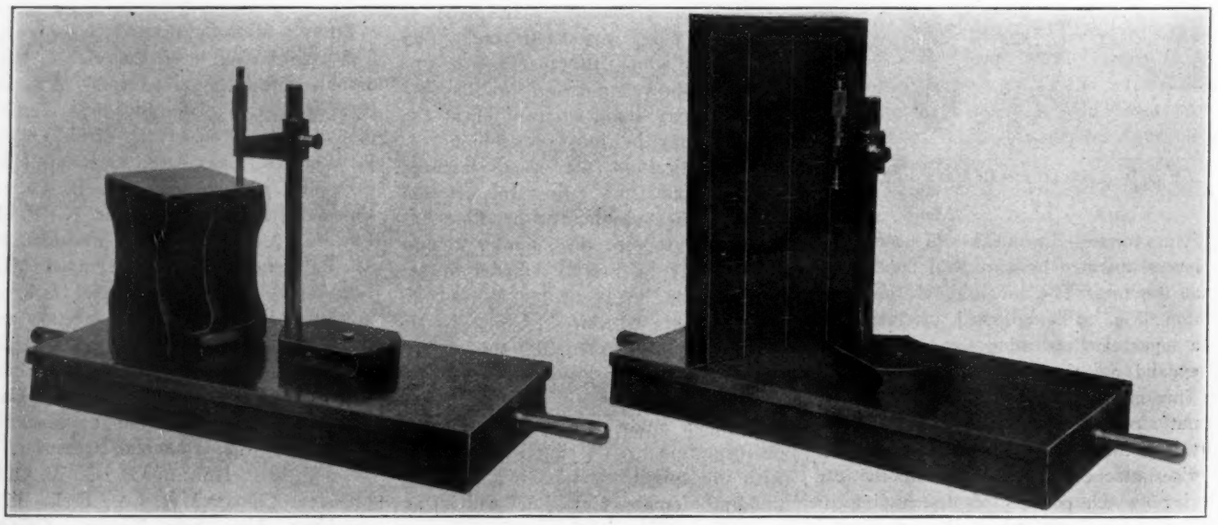


FIG. 3—INSTRUMENT BEING USED TO MEASURE HEIGHT BLOCK.

FIG. 4—LAYING OUT JIG PLATE BY USING INSTRUMENT AS A SURFACE GAGE AND SCRIBER.

inches by 0.001 inch. They are useful in setting the tables of milling and boring machines to an exact position in relation to the centers of their spindles, and also in measuring the various heights of planed and milled work, the heights of jig bushings, etc.

Fig. 4 shows the instrument used as a scribing gage with a circular scriber attached to the end of the measuring spindle. This disc is notched on its periphery as shown, the lower face of the disc being ground at right angles to its bore. The upper side of the disc is ground at a slight angle and to a sharp edge, the points formed by the notches being the scribing elements. The lower side of the disc is drilled and tapped for a screw the head of which projects over the wall of the bore and locates the scribing line in the plane of the end of the measuring spindle. The disc is slotted and clamped to the spindle by means of a binding screw. The face of the disc being flat no subsequent grindings in the faces of the notches to keep the scribing points sharp will modify its accuracy. Taken in connection with the height blocks, lines may be drawn on work from 1-16 inch of the base surface to the full range of the instrument by 0.001 inch as readily as the same measurment can be taken. It is of course understood that the measuring spindle should be locked before the scribing is done.

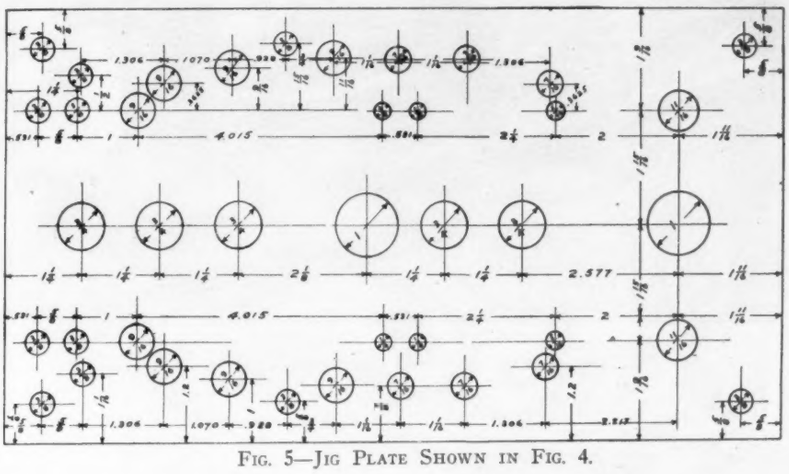


FIG. 5—JIG PLATE SHOWN IN FIG. 4.

In Fig. 5 is shown a jig plate, the center distances of which are being laid out in Fig. 4. The laying out of this plate required 35 minutes, the work being done twice for verification.

The Sharon Steel Casting Co., Sharon, Pa., has issued a 1909 calendar, containing the picture of a pretty girl. The gracefulness of the pose and the rich and blended coloring render the calendar an unusually attractive one.

THE LODGE & SHIPLEY HEAVY PATTERN AXLE LATHE.

The accompanying illustrations show an extra heavy design in axle lathe construction, with an extremely powerful drive, rigid construction and every convenience that the character of axle turning would demand. The tool is the product of the Lodge & Shipley Machine Tool Co.

The bed is of massive construction, the cross girths being of box section. A longitudinal member of box section is cast in the center of the bed, extending its length parallel to the outer walls, and is for the purpose of further stiffening the cross girths. The walls of the bed are heavy and the metal on the upper and lower edges is as nearly equal as possible. The ends of the bed are cut away to facilitate the removal of the tail stock, or to permit of a reasonable overhang for unusual length. In addition to the front and rear Vs with the inner flat tracks, an additional 45-degree plane surface has been machined upon the bed in order to accommodate the bearing of the carriage upon the bed.

The drive is simple in design and has great possibilities for delivering power to the cut. Power is applied to a constant speed pulley of large diameter and wide face, running at a high velocity. The variation in speed is obtained by sliding gears which run in a bath of oil. All shafts are carried in bushed positive ring-oiled bearings. All gears are of steel. The driving shaft is of large diameter and held in alignment by a number of journal blocks bolted to the bed. There is no overhang on the pinion of the main driving gear, since the shaft is supported on either side of

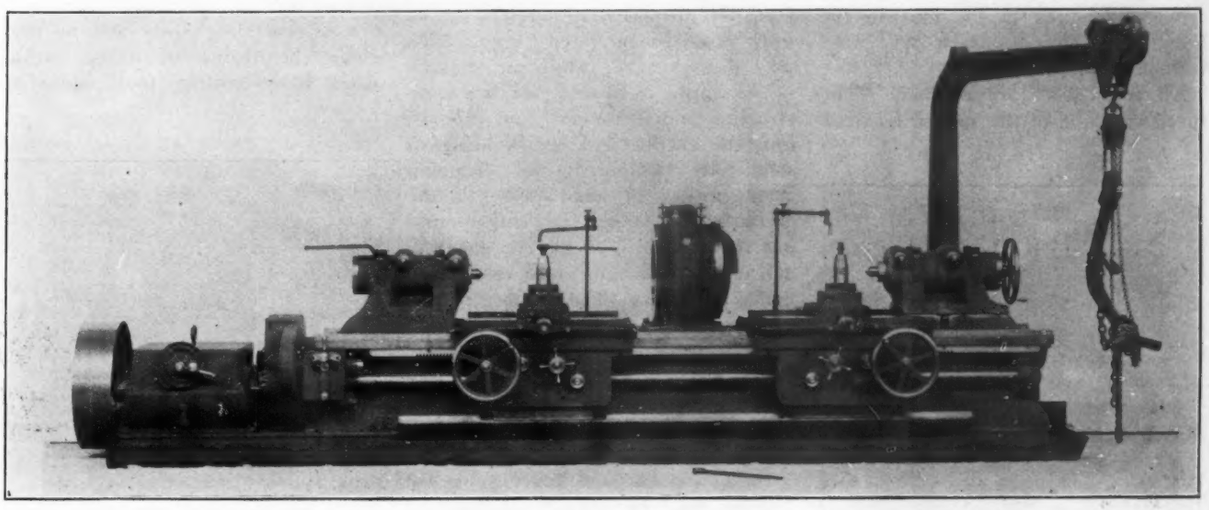


FIG. 1—AXLE LATHE WITH CRANE.

it in long bearings. The large gear meshing with this pinion is placed in the center of the driving head, and as with the pinion, has a double

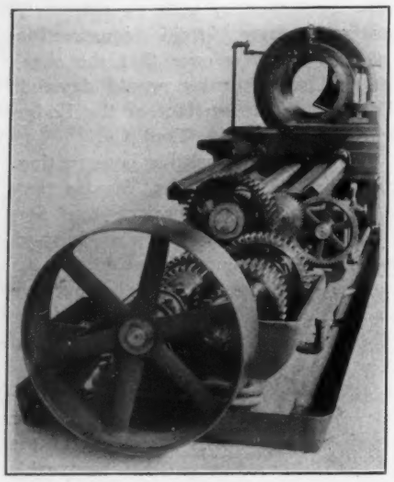


FIG. 2—END VIEW, SHOWING DRIVING SHAFT AND CARRIAGE BEARING ON BED.

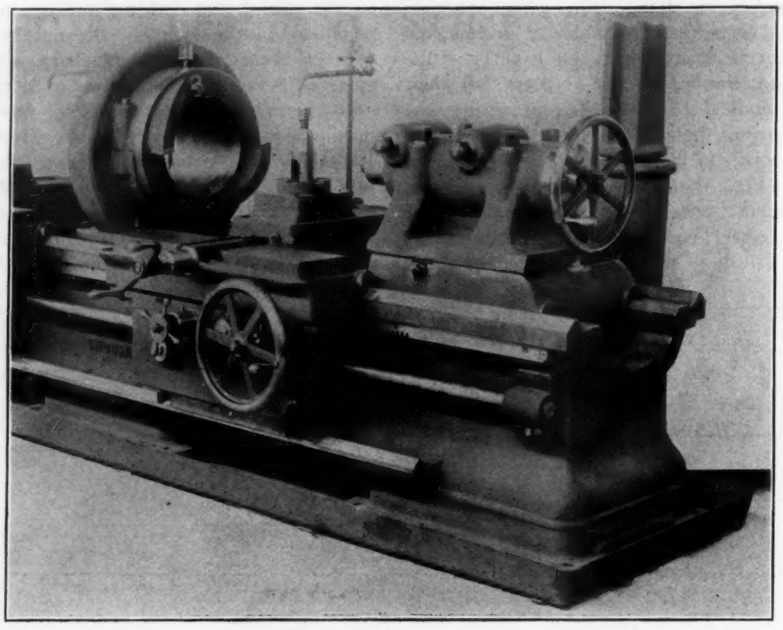


FIG. 5—BEARING OF APRON ON THIRD V OF LATHE.

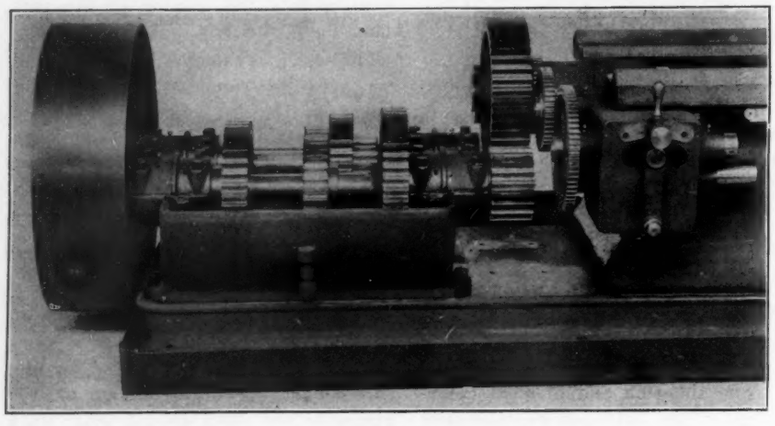


FIG. 3—GEARS FOR DRIVE, TOGETHER WITH FEED GEARS.

bearing. A powerful compensating driver is secured to the gear in the head, the dogs of which are faced with steel plates.

All feed gears are of steel. The speed variation of the splined feed rod is effected by the gear train driving from the main shaft through a change gear box, giving three feeds which may be changed while in motion.

The apron is of compact box construction and is tongued and grooved into the carriage, all gears being of steel. In addition to the clamping arrangements of the apron to the carriage, the apron is further supported by a third V cast on the bed, and in such position as to be directly under the apron. The purpose of this construction is to support the apron at the bottom for both vertical and transverse stress. The spring of the apron due to the thrust from the rack pinion is thus effectively overcome.

In addition to the bearing on the Vs on the front and rear shear of the bed, the carriage also has a flat bearing on the inside of the front shear. A further angular bearing of 45 degrees tends to secure a permanent alignment of the carriage with the bed. The carriage bearing upon bed is of importance in view of the great thrust from the burnisher as well as from heavy cutting. Water troughs are provided around the tool slide and wings of the carriage. The tool posts are arranged with hardened toothed plates interlocking with the tool and effectively preventing any possibility of the tool swiveling or slipping under the heaviest cuts. The tool slide is of steel.

The tailstocks are of massive construction and firmly bolted to the bed. The clamps are brought to the top of the spindle barrel. A pawl, engaging with the rack, cast in the bed, is attached to each tailstock, this design tending to relieve the strain on the clamping bolts and to overcome the thrust of heavy cutting, when blunt cutting tool angles are

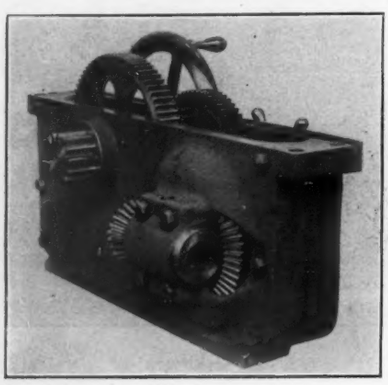


FIG. 4—DOUBLE OR BOX APRON.

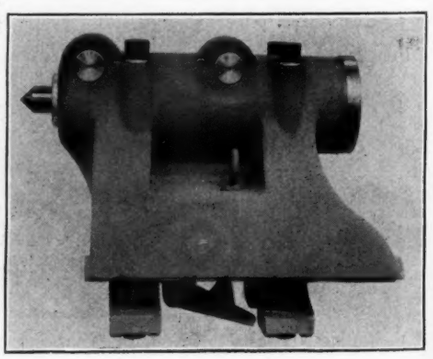
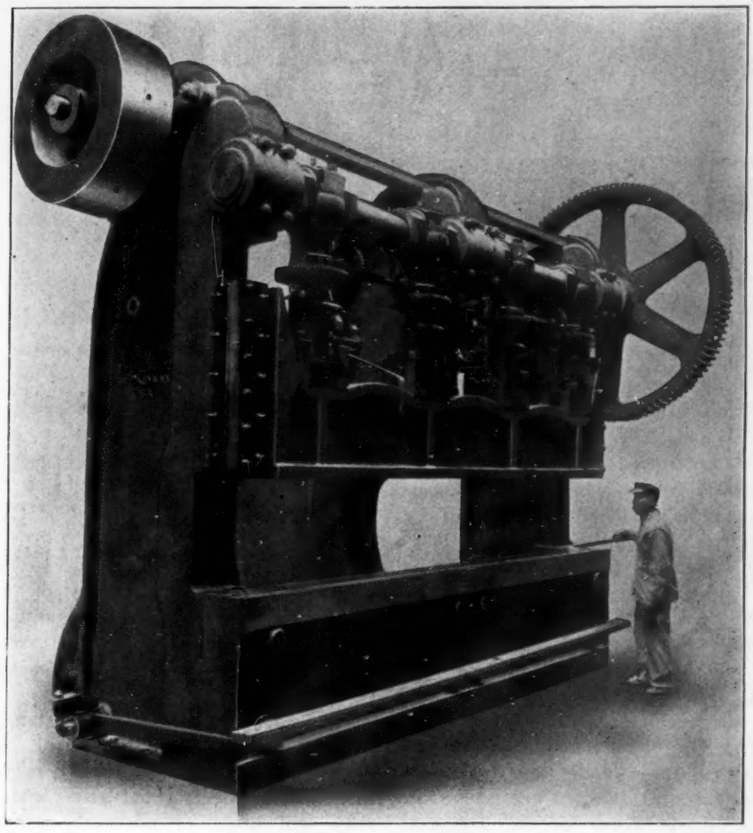


FIG. 6—TAILSTOCK—ALSO SHOWS METHOD OF CLAMPING TO BED, AND THRUST BLOCK FOR LOCKING TAIL SPINDLE.

used. The tailstock at the driving end has a stationary spindle with no transverse adjustment, the necessary adjustment being obtained from the spindle of the second tailstock, which is also provided with a transverse adjustment. The plug clamps for binding the tail spindles are of improved design, two instead of one for each tailstock and placed at the top of the spindle barrel.

A LARGE DOUBLE DOUBLE-CRANK PRESS.

The E. W. Bliss Co., No. 8 Adams street, Brooklyn, N. Y., has recently designed and built the large double



Bliss Double Crank Press.

double-crank press shown in the accompanying illustration. The constant demand for increased size in the product of power presses, due to the requirements of new fields of manufacture into which they are entering, has necessitated a constant growth in their dimensions. The press shown is one which until recent years would have been considered beyond the capabilities of press builders, and is worthy of mention on account of its massive construction. It is now, however, simply an unusually large machine of the well known double crank type, of a special design, being in reality a double double-crank press.

The machine is especially adapted for the operation of very long and narrow dies, for punching, forming, piercing, bending and similar operations which require great pressure. It embodies certain improvements in detail which adapt it to the special work it has to do. The machine, which is double geared, is driven by a powerful friction clutch located on the driving shaft, which clutch is engaged and disengaged by means of the treadle running along the entire front of the press. The treadle is connected by treadle levers with a treadle shaft located at the rear of the press to which is attached the counterweights and connections which operate directly upon the clutch. By this construction the press is under the instant control of the operator from any point in front of the press, this being of decided advantage over the regular construction in which the clutch is controlled by a lever or treadle at the side which often compels the operator to walk from one end of the press to the other in order to start and stop it.

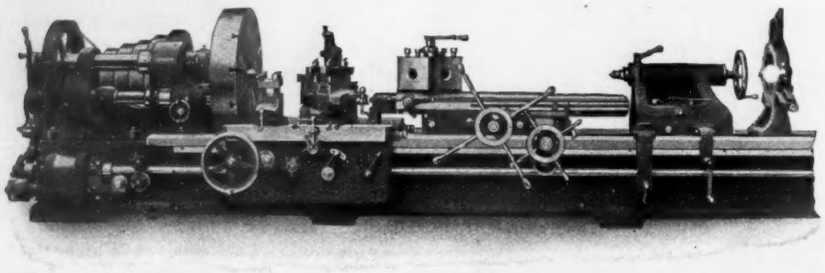
In the construction of large presses of the double crank type an important consideration on account of alignment and weight is the adjustment of the slide. In the press shown this is taken care of in an effective and simple way by a chain drive—the chains running from the shafts carrying the adjusting bevel pinions back to a small driving shaft which runs the entire width of the press. This shaft, which derives its power by means of a belt from the main driving shaft, is fitted with two friction clutches. In order to raise or lower the slide it is only necessary for the operator to shift the lever located above the slide between the two cranks at the left hand side of the press which engages the clutch which operates the chain drive. This in turn operates the four adjusting screws in unison, and in addition to quickly doing what would otherwise be slow and laborious work, insures the perfect alignment of the slide in relation to the bed. By shifting the lever to the right the slide is raised, and by shifting to the left it is lowered. The type of clutch used insures a very fine adjustment of the slide.

The bed, which is removable, has an area of 154 inches right to left and 10 inches front to back. The distance from the bed to the slide with stroke down and adjustment up, is 20 inches. The crank shaft is 8 inches diameter and has a 2½-inch stroke. The proportion of gearing is 18:1 and all the teeth in the train of gears are cut from the solid. The main gear is 75 inches diameter, 9 inches face, and weighs 3,700 pounds. The arrangement of the gearing is not clearly shown in the front view of the press, but it is very compact and powerful, and is so arranged that it will not interfere with an operator standing at the back of the press. The flywheel is 36 inches diameter with a 12-inch face, and weighs 2,400 pounds. The total height of the press is 149 inches, and the total weight something over 72,000 pounds.

Construction work upon the main building of the Ohio Seamless Tube Co., at Shelby, O., has been completed by the McClintic-Marshall Construction Co., Pittsburg. The structure is of heavy mill design and 180 x 360 ft. in dimensions. The McClintic-Marshall Co. is now at work upon the erection of a second smaller structure, which will connect the main building with another large building that was already upon the site.

A HEAVY AMERICAN ENGINE LATHE.

The accompanying illustration shows a 36-inch, heavy pattern, American triple-geared engine lathe with a turret mounted on shears. The machine is fitted with an improved change gear mechanism, providing 32 changes for feeding and thread cutting, the range of threads being from one thread in 4 inches to 16 threads per inch, including 11½ pipe thread. The feed range is 6.4 to 92 cuts per inch. The device is operated while the machine is running, by revolving a nut at the right of the gear box beneath the head. This moves a sliding key, engaging two opposed gears, each being one of a cone set contained in the gear box. The screw pitches thus obtained are multiplied through compound gears, which arrangement gives flexibility to the screw-cutting mechanism, making it possible, through the introduction of certain gears, to cut practically an unlimited range of special worms or threads, either finer or coarser than indicated above.



"American" Heavy Engine Lathe With Turret.

The bed is of deep section, exceptionally heavy, and of the drop-V pattern. It has cross-box girders at short intervals its entire length, and is further strengthened by a rack cast in the center for engaging the pawl of the tailstock. The headstock is built with triple gears, and is firmly bolted to the head. The cone has five steps. The triple gears are of the slip gear type, and are engaged by a rack and pinion at the front of the head. The internal gear is planed integral with the face plate, and the pinion is cut solid with the shaft. Fifteen speeds are obtained with these gears in geometrical progression.

The carriage is heavy and has a continuous bearing of 50 inches on the ways. It is gibbed to the bed for its entire length. The apron is firmly bolted to the carriage for its entire length. It is double, giving all shafts a double bearing.

The turret on the shears is of new design, and is equipped with an indexing mechanism, which is self-compensating for wear. This mechanism is located at the front of the turret top-slide, bringing the locking-pin nearer the tool. The turret can be tripped or revolved automatically, or by hand, and the mechanism can be set, so as to be inoperative, when it is desired to run the slide back to the extreme limit without withdrawing the locking pin or revolving the turret. This is accomplished by the small lever shown near the large pilot wheel.

The turret top-slide is supported on its outer end by a gibbed bracket attached to the front of the slide, which travels along the Vs of the bed, and, through its support, eliminates all tendency to spring under a long reach. The bottom slide of the turret is moved along the bed by the pilot wheel shown at the rear end. It is clamped to the bed by eccentrics, one on either end. It is further secured from slipping by a pawl, which engages a ratchet-toothed rack in the center of the lathe bed.

The turret feeds are eight in number and range from 0.005 inch to 0.162 inch. These are entirely independent of the regular carriage and apron feeds. The turret feeds are controlled by two "star" knobs, carrying index dials, which are shown one above the other at the front of the bed near the feed box. These operate through shafts extending through the bed to the quick-change turret feed box at the rear of the headstock. Provision is made on the compound rest slide to quickly attach the turret top slide to it. It is a valuable feature in tapping operations. It is also of value in ordinary jobs of chasing threads with a tool. The feeds of the turret can be reversed, which is a valuable feature when it is necessary to backface or counterbore. This reversal is controlled by the lever located on the driving sprocket of the quick-change turret feed box.

The over-all length of this machine is 12 feet, but it is built in even lengths of bed up to any desired length. The 12-foot size takes 4 feet 9 inches between centers, and has a swing over Vs of 38 inches and over the carriage of 26 inches. This machine was built by the American Tool Works Co., Cincinnati.

A NEW DRILL SOCKET.

The accompanying illustrations show features of the "stay in" drill socket. The principal feature of this socket is that it will hold drills with or without tangs and the fact that the socket will remain in the drill press spindle. This latter is accomplished by having the shank of the socket grooved to fit the round key in the drill press spindle. This key is applied to the spindle of the drill press in the same manner as in the socket shown.

The "Stayin" Drill Socket.

To use old drills with broken tangs, a flat is ground on the shank, as shown, thereby enabling them to be inserted in the socket, after which they will drive as positively as an ordinary drill with an unbroken tang. To use new drills with this socket, a V-groove is milled in the shank, as shown. This insures a better bearing of the key on the drill than by grinding a flat. The hardened steel keys are pressed into the sockets parallel with the bore and central with the tang slot. The key projects into the hole only one-third of its diameter.

The outside diameter of the drill sockets are made larger than standard, so that they are not weakened by the insertion of the key. This socket is manufactured by the G. R. Lang Co., Meadville, Pa.

A TROLLEY AND CRANE TRANSFER SYSTEM.

In order to reduce the amount of labor required, to introduce a greater flexibility in handling material and to avoid some of the congestion of its yard, the Simmons Mfg. Co., of Kenosha, Wis., has installed an electric traveling yard crane in combination with mono-rail electric traveling hoists particularly for service in connection with the operation of three cupolas. The carrying system was designed and built by Pawling & Harnischfeger, Milwaukee, and is shown from several viewpoints in the accompanying illustrations.

The character of the installation is not generally new except in some details, but the adaptation is interesting. It is reported that the substitution of this carrying system for the more frequently encountered narrow gage track, trucks, cars and elevators, has resulted in a reduction of the number of men required to run the three cupolas, load and charge material from 25 to three or four. The hoists and crane handle scrap, coke, pig stone and other material with equal facility, and in addition have a wider range of usefulness in the foundry yard than surface facilities.

The crane has a span of 60 feet and is mounted on structural steel runways. The crane bridge is built up of latticed, riveted plate girders bound together by structural frame ends. Suspended from each girder horizontally are two 15-inch I-beams which serve as runners for the traveling hoists. These hoists are electrically operated by a standard two-motor drive and are controlled from trailing enclosed cages as shown, each hoist requiring one operator. One machine carries an electro-magnet for handling the pig and scrap and the other carries a large dumping bucket for handling coke and stone. It is apparent that there would be little occasion for operating the crane when it is not carrying the magnet-hoist and so the services of a separate crane operator are obviated by the placing of the crane-controlling mechanism in the cage of the magnet-hoist. The bridge-travel motor and drive are mounted on the crane girders in the usual manner.

The distributing I-beam-runways for

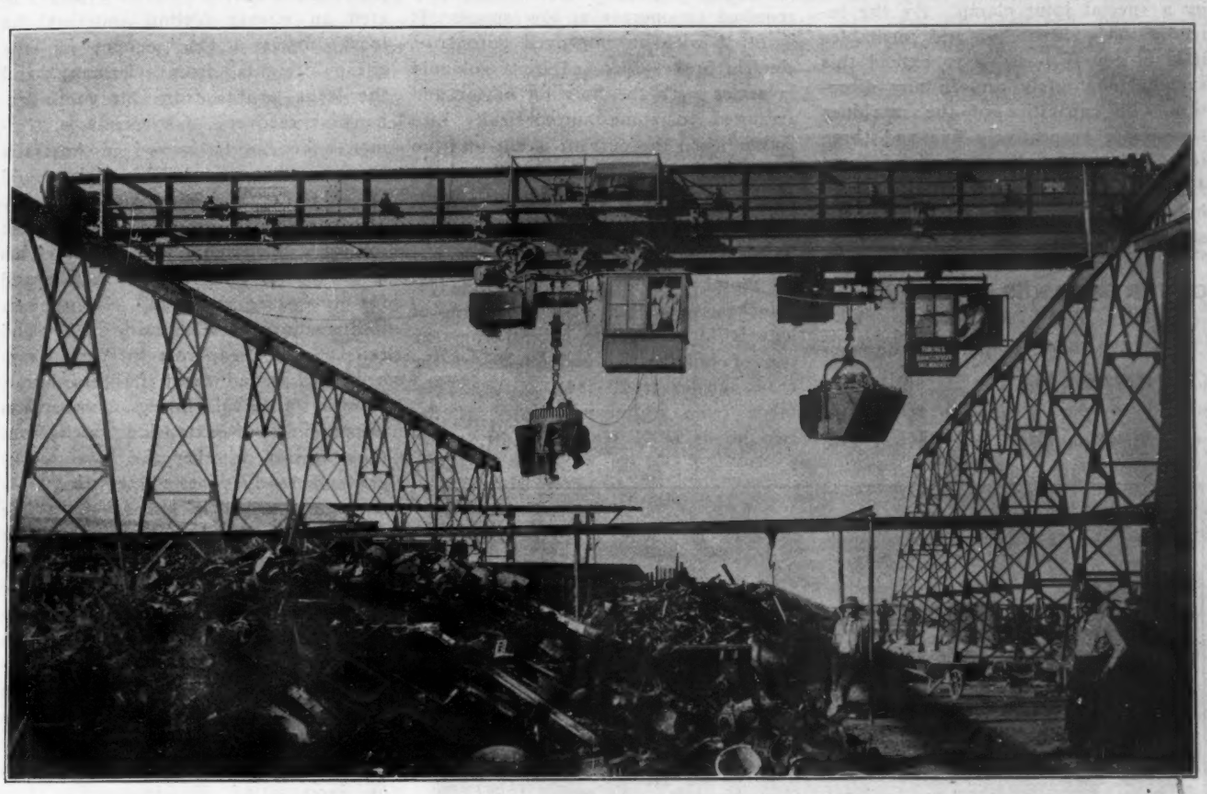


FIG. 1—ELECTRIC HOISTS ON CRANE OVER SCRAP YARD.

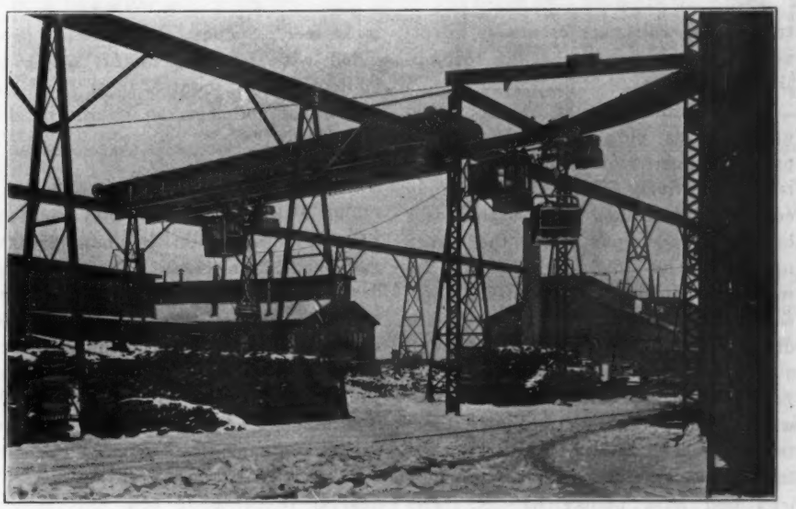
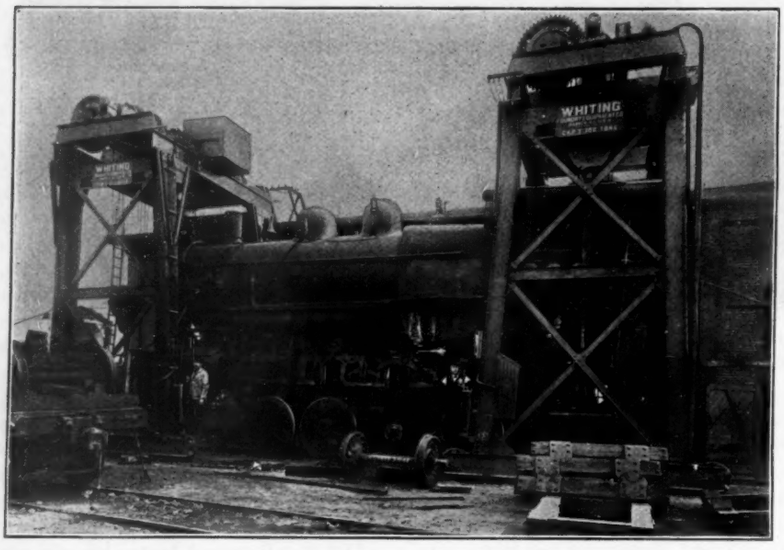


FIG. 2—ELECTRIC HOISTS LEAVING CRANE TO ENTER FOUNDRY.

the hoists are built out from the crane runway structure into the several cupola buildings, the runways being in proper alignment with the beams suspended from the cranes to permit of a continuous connection made secure by a special joint clamp. By the introduction of switches and turntables it is of course possible to extend this system indefinitely and in any direction. The capacities of the machines shown are respectively five and three tons wth a traveling speed of from 400 to 450 feet per minute, both hoists and crane bridge having the same speeds.

GANTRY CRANES FOR LOCOMOTIVE WORK.

The Whiting Foundry Equipment Co., Harvey, Ill., has recently furnished to the Great Northern Railway, St. Paul, Minn., six 100-ton gantry cranes, which are especially adapted for lifting and unwheeling locomotives.



WHITNEY GANTRY CRANES FOR LOCOMOTIVE WORK.

Two of these cranes are shown in use for this purpose in the accompanying illustration. The installation is comparatively inexpensive, the only equipment furnished by the purchaser being the rails upon which the cranes operate. The load is hoisted by means of steel wire hoisting rope, winding on hoisting drums, which are driven from an electric motor through a system of spur and worm gearing. Each crane is carried by two two-wheel trucks of structural steel section provided with bearings for the main axles. The wheels are of cast iron and have double flanges. The hoisting gearing is supported on the bridge girders by means of structural steel framing. The design of the drums insures an equal distribution of the load on the girders. The whole outfit is designed with a factor of safety of five. The hoisting motor is comparatively small, since it is only required to operate at low speeds. It is fitted with an improved automatic, electric brake, operated by a solenoid in series with the hoisting motor and arranged to come automatically into action when the current is cut off from the motor circuit. All operating parts are easily accessible for oiling and repairs.

The span of the cranes from center to center of runway rails is 14 feet 6 inches, while the clearance inside of legs is 13 feet. The height from the top of rail to the under side of the crane girder is 20 feet, and the distance from center to center of the two hooks is 11 feet. The lift travel is 14 feet 6 inches. The crane is provided with but one motor, which is controlled by a controller at the base of one of the legs, as shown in the illustration.

The Portland Gas Co. has recently placed in operation its new $30,000 gas purification plant. The plant was designed by H. M. Papst, general manager, and is the only one of its kind in the world. It completely removes the sulphur, and its accompanying odor, from the oil gas which is manufactured at this plant in place of the ordinary water gas. The plant was made possible only after a great deal of experiment and successfully solves a difficult problem in gas purification.

AUSTRALIAN COKE INDUSTRY.

(Special Correspondence.)

Sydney, N. S. W., Nov. 16.—The arrival of several large shipments of German coke (part of a contract with some big smelting concerns) has created an uneasy feeling amongst the local makers. On account of the cheap freights from Germany and the large profits from the more exhaustive recovery of by-products, German coke can be landed in Australia cheaper than the local article could be sold. It has been authoritatively stated that the carriage on a recent foreign consignment was $2.75. This is about the same rate as is charged for interstate carriage. It appears that sailing vessels carry coke and rails at this cheap rate to Australia in order to have wheat freights home. The fact that this foreign competition is possible of extension opens out the question whether the local works are sufficiently protected by the present duty, which is $1 per ton. The output of the local ovens for last year was close upon 300,000 tons, and the demand is steadily increasing. The price at the works averages $4.20 per ton. It is held that if local producers wish to stop foreign competition they must adapt their plants to modern requirements. Several managers have recommended the more minute recovery of by-products. Others advocate an increase of the duty. The fact remains that there is a probability of foreign coke ousting the local product from its own market.

RAILROAD EXTENSION NEEDED.

The Southern Commercial Congress, with delegates representing 64 commercial organizations in 14 southern states, assembled in Washington on Dec. 8, unanimously and with spontaneous and enthusiastic applause, passed the following resolution, expressing its attitude toward railroads:

Railroad construction has been extensive, but the rapid commercial growth of the south requires an enormous increase in its railroad facilities to transport to market its many and varied products. The construction of such adequate facilities can be accomplished only by assuring the holders of capital that such enterprises will be safeguarded by conservative and constructive legislation, and we urge upon our southern legislators the wisdom of such policy and condemn any agitation leading to the contrary.

We favor a spirit of co-operation between the people and railroads and other corporate interests, to the end that the required confidence of investors may be established in the securities of the corporations of the south.

Prices Recover to Highest of Ye ar.

Although the operations of the New York stock market last week were restricted to four days, the exchange being closed Saturday as well as Christmas day, the general tone was strong and the trading active. Following the break on Monday, the market was well supported, a feature of the strong advance being noted in the number of medium priced stocks that were dealt in.

The market opened active and weak Monday, and prices broke from one to five points, there being an absence of support. A moderate rally marked the close, but the tone was uncertain. Prices recovered sharply Tuesday and closed strong and higher. Gold to the amount of $700,000 was exported to Paris. Sales reaching a million and a quarter shares characterized a buoyant market Wednesday, prices closing at the highest of the day. While less activity was noted Thursday, the tone was firm, and in a number of cases prices advanced to the highest of the year. The foreign bank statement showed a further large gain in gold by the Bank of France and a large decrease in reserve by the Bank of England. Exchanges throughout the country and abroad closed Friday and Saturday.

The weekly bank statement showed a decrease of $39,234,800 in loans, a decrease of $46,760,500 in deposits and an increase of nearly $7,000,000 in surplus reserve. The total surplus reserve today is $16,923,325, which compares with a deficit of $20,170,350 this time last year. The actual figures of the clearing house banks showed loans decreased $23,665,300, and the ratio of reserve 26.6 per cent, an increase of 0.4 per cent. State banks and trust companies showed loans increased $9,706,600; deposits increased $5,903,300, and the percentage of reserve 27.1, a decrease of 1.4. Call loans ranged between 2½ and 3¾ per cent, while the time loan rates were easier. It is estimated that dividends, interest disbursements, etc., for the month of January will exceed $180,250,188, a decrease of $2,403,345, compared with the same month a year ago. Commercial failures for the week were 240, compared with 330 the preceding week and 280 the corresponding week last year. Shares were sold to the number of 4,618,159, compared with 5,454,600 the preceding week and 1,368,400 the corresponding week last year. Bonds exclusive of government bonds were sold to the amount of $36,992,000, compared with $29,822,000 the preceding week, and $6,104,000 the corresponding week last year.

Copper Stocks.

Boston.—Butte Coalition closed 27, a net gain of 1; Calumet & Arizona closed 118, a net gain of 2; Calumet & Hecla closed 660, a net loss of 5; North Butte Mining closed 85¾, a net gain of 2; Quincy Mining closed 95, a net gain of 2.

New York.—Amalgamated copper closed 82½, a net gain of 3½.

Financial Notes.

The Montreal Steel Works has declared the semi-annual dividend of 2 per cent on common stock, payable Jan. 30, and a quarterly dividend of 1¾ per cent on preferred, payable Jan. 8; the Vulcan Detinning Co., the regular quarterly dividend of 1¾ per cent on preferred, payable Jan. 20; Manning, Maxwell & Moore, the regular quarterly dividend of 1½ per cent, payable Dec. 31.

The stockholders of the Wheeling Enameled Iron Co., Wheeling, W. Va., at the recent annual meeting authorized the board of directors to issue preferred stock to the amount of $60,000, making its total capital stock $180,000. By the action thus taken, the affairs of the company will be taken out of the hands of J. E. Wright, receiver. Within a few days, a meeting will be held for the purpose of re-organization.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. Dec. 24	Changes in Week	Date 1908 Ann. M't'g	Stock Outstanding	Dividend Basis	Dividend Last Declared	Dividend Date Last Div. Pay.
Allis-Chalmers	15⅝	+ ⅛	Sept. 3	19,820,000			
Allis-Chalmers pr	49⅛	+ ⅜		16,150,000	7 cum	1¾ Q.	Feb., 1904
American Can	8¾	...	Feb. 8	41,233,300			
Am. Can pr	73½	+ ½		41,233,300	7 cum	1¾ Q.	Oct., 1908
Am. Car & Foundry	44	+3¼	June 25	30,000,000		½ Q.	Oct., 1908
Am. Car & Fdy. pr	109	+1		30,000,000	7 n. c.	1¾ Q.	Oct., 1908
American Loc	57⅜	+3⅛	Oct. 20	25,000,000	5	1¼ Q.	Aug., 1908
American Loc. pr	111½	+1		25,000,000	7 cum	1¾ Q.	Oct., 1908
American Ship	56	.....	Oct. 14	7,600,000	4	1 Q.	June, 1908
American Ship pr	105½	.....		7,900,000	7 n. c.	1¾ Q.	Oct., 1908
Am. Steel Foundries. pr.	47⅝	....	Oct. 6	15,810,000			
Am. Steel Foundries(new	38⅜	— ⅛		14,247,400	6 cum	2¼	Aug., 1904
Barney & Smith	40	.....	June 2	2,000,000	4	1 Q.	Sept., 1907
Barney & Smith pr	110	.....		2,500,000	8 cum	2 Q.	June, 1908
Bethlehem Steel	24	+3	April 7	14,862,000			
Bethlehem Steel pr	54⅞	+3⅝		14,908,000	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	39¼	+1⅛	March 17	45,000,000*	6	1½ S. A.	Aug., 1908
Cambria Iron	46⅜	.....		8,468,000*	4	2 S. A.	Sept., 1908
Chicago Pneumatic Tool	20	—5	Feb. 17	6,145,800	4	1 Q.	Oct., 1907
Colorado Fuel	40⅛	+2⅝	Oct. 19	34,235,500		3½	April, 1902
Crucible Steel	8	.....	Oct. 21	24,578,400			
Crucible Steel pr	57	— ⅛		24,436,500	7 cum	1 Q.	Dec., 1907
Empire Steel	6	.....	Feb. 26	1,254,770			
Empire Steel pr	47	.....		2,500,000	6 cum	3 S. A.	July, 1908
Fay & Egan	90	.....	Feb. 18	1,000,000	6	1¾ Q.	Nov., 1908
Fay & Egan pr	100	.....		1,000,000	7 cum	1¾ Q.	Nov., 1908
General Electric	158	+1	May 12	65,167,000	8	2 Q.	Oct., 1908
Harbison-Walker	17⅛	+ ⅛	Jan. 20	18,000,000		½	Oct., 1907
Harbison-Walker pr	80	.....		9,600,000	6 cum	1½ Q.	Oct., 1908
International Pump	33¾	+ ⅜	June 2	17,787,300		1	April, 1908
International Pump pr	81⅝	+1⅜		18,835,000	6 cum	1¾ Q.	Nov., 1908
Lackawanna Steel	47	+2	March 11	34,971,400			
Lake Sup. Corp	17	+3⅛	Oct. 7	40,000,000			
New York Air Brake	98¾	+6¾	June 18	8,012,500	8	2 Q.	Oct., 1907
Niles-Bement-Pond	97	.....	Feb. 5	8,500,000	6	1½ Q.	Dec., 1908
Niles-Bement-Pond pr	100	.....		2,000,000	6 cum	1½ Q.	Nov., 1908
Otis Elevator Co	40	.....	March 16	6,156,600		1½ S. A.	April, 1908
Otis Elevator Co. pr	94	.....		5,449,500	6 n. c.	1½ Q.	Oct., 1908
Penn. Steel	50	.....	May 11	10,750,000			
Penn Steel pr	104	.....		16,500,000	7 n. c.	3½ S. A.	Nov., 1908
Pittsburg Coal Co	14	.....	Feb. 10	28,853,400			Nov., 1906
Pittsburg Coal Co. pr	49¾	....		27,080,800	7 c.	1¾	April, 1905
Pressed Steel Car	43	+1½	Feb. 19	12,800,000		3	Aug., 1904
Pressed Steel Car pr	100¾	+ ¾		12,500,000	7 n. c.	1¾ Q.	Nov., 1908
Pullman	169¾	— ¼	Nov. 11	100,000,000	8	2 Q.	Nov., 1908
Railway Stl. Spring	48⅛	+1⅛	March 5	13,500,000	4	2 S. A.	Oct., 1908
Railway Stl Spring pr	101	+1		13,500,000	7 cum	1¾ Q.	Sept., 1908
Rep. Iron & Steel	25⅜	+ ½	Oct. 21	27,191,000			
Rep. Iron & Steel pr	85⅝	+ ⅛		20,416,900	7 cum	1¾ Q.	April, 1908
Sloss-Sheffield	78	+1	March 11	10,000,000	5	1 Q.	Dec., 1908
Sloss-Sheffield pr	110	.....		6,700,000	7 n. c.	1¾ Q.	Sept., 1908
U. S Pipe & Fdy	28¾	+ ¼	June 24	12,500,000	4	1 Q.	Dec., 1907
U. S. Pipe & Fdy pr	75¾	.....		12,500,000	7 n. c.	1¾ Q.	Sept., 1908
U. S Steel	54	+1¼	April 20	508,302,500	2 n. c.	½ Q.	Dec., 1908
U. S. Steel pr	112¾	+ ⅜		360,281,100	7 cum	1¾ Q.	Nov., 1908
U S. Steel 5;	102¾	+ ¼		463,798,000	5	5 A.	.....
Va. Iron, Coal & Coke	62¾	.....	Nov. 17	9,073,680			
Westinghouse Elec	86	— ½	June 24	28,933,200	10	2½ Q.	Oct., 1907
Westinghouse Air Brake	112	+3	Oct. 6	14,000,000*		2½ Q.	Oct., 1908

Par value of shares, $100, except those starred (*), $50

NEWS FROM MANY INDUSTRIES

New Buyers:—

The Mack Iron & Wireworks Co., Sandusky, O., has been chartered by A. D. Mack, P. C. Mack, E. M. Blinn, J. D. Mack and J. T. Mack, with $50,000 capital stock.

The Advance Machine Works, Ltd., has been incorporated with $30,000 capital stock at Walkerville, Ont. George A. True, Edward S. Reid and Henry W. Standart are provisional directors.

The Canadian O. K. Grain Shocker Co., Ltd., of Winnepeg, Man., capitalized at $500,000, has been incorporated by John G. Stewart, George J. Lovell, William F. Thorne and others.

The Sand Making Machine Co., Greenfield, O., with $10,000 capital stock, has been incorporated by E. S. McClain, C. McClain, A. E. McClain, F. Baldwin and J. L. Cowman.

The Dixie Culvert & Metal Co., Middletown, O., through Rufus C. Phillips, R. P. Caldwell, G. H. Charles and R. P. Carnahan, incorporators, has been incorporated with $10,000 capital stock.

The Wyanacme Co., 108 LaSalle street, Chicago, has been incorporated with $10,000 capital stock to manufacture railway supplies by Charles F. Lowry, Albert Goetz and Arthur W. Goetz.

Walter G. Morley, N. A. Bartlett, and others have been incorporated as the Reo Automobile Co., Ltd., with $40,000 capital stock, to manufacture automobiles at Windsor, Ont.

The Empire Car Wheel Co., Buffalo, to manufacture car wheels and iron castings, with $48,000, has these incorporators: Seward H. Millener, William J. Donovan, Edward H. Murphy, Buffalo, N. Y.

The Jordan Machine Co., Cohoes, N. Y., to manufacture machinery, with $2,500 capital stock, has been chartered by Cornelius Jordan, John F. Quinn and Walter H. Wertime, Cohoes, N. Y.

The Del Sales Co., Marquette building, Chicago, has incorporated to deal in electrical tools and supplies, with $100,000 capital stock. The incorporators are A. M. Lovelace, George J. Danz and E. Cardin.

The Casley Valve Co., New York City, to manufacture valves, couplers and gages, with $10,000 capital stock, has been incorporated by William A. Lock, 99 John street, C. Montreith Gilpin and Harry A. Stuart, 68 William street, all of New York.

A charter has been granted to the United States Lock Nut Co., New York City, to manufacture lock nuts, with $50,000 capital stock. The incorporators are Leon H. Brach, 143 Liberty street, Eugene W. Mente, Astor house, and B. H. Stern, 2626 Broadway, all of New York City.

The Vulcan Furnace Co., Utica, N. Y., machinery and tools, with $20,000 capital stock, has been incorporated by Sanford F. Sherman, New Hartford; DeWitte H. Palmer, Buffalo; Edward F. Cookingham, Utica, and Joseph E. Batchelder, Beloit, Wis.

The Morgan Vacuum Valve Co., Rochester, N. Y., has been incorporated to manufacture tools, devices and supplies for heating, plumbing and building trades, with $75,000 capital stock. The incorporators are John B. Morgan, Josephus Albee and George G. Ford, Rochester, N. Y.

Steel Iron Products Co., New York City, to manufacture products of steel and iron, with a capital of $25,000. The incorporators are James F. Farren, 5 Nassau street, New York; John L. Allen, 1326 Fulton street, Brooklyn, N. Y., and Walter R. Herrick, 115 Broadway, New York City.

A charter has been granted to the John Sharpe Co., Long Island City, to manufacture iron and steel work with $5,000 capital stock. The incorporators are John Sharpe, 196 Main street; John S. Corey and Daniel Donaldson, 2 Fulton avenue, all of Long Island City.

Osterweis Bros. Inc., New York City, has been incorporated to manufacture and sell machines and mechanical devices, with a capital of $3,000. The incorporators are Lee L. Osterweis, Jesse Osterweis, Jacob C. Hamberger, 993 Lexington avenue, all of New York City.

Articles of incorporation have been filed by the Harlem Mfg. Co., White Plains, to manufacture valves, grates, boilers, heaters and stoves, with $10,000 capital. The incorporators are Frederick H. Sauer, 75 East Eighty-first street; Henry M. Wise, 1748 Broadway; William M. Wise, 1748 Broadway; William F. Ashley Jr., 40 Exchange place, all of New York City.

The Memphis Steel Construction Co., Memphis, Tenn., has been incorporated to purchase the Oldum-Taylor Boiler Works and enlarge and remodel the plant for the manufacture of structural iron and steel. The company has $100,000 capital stock and these incorporators: George R. James, W. A. Hein, S. B. Anderson, C. A. Hunt and T. K. Riddick.

The California Metallic Packing Co. has filed articles of incorporation, with $100,000 capital stock. The company has been organized for the purpose of providing metallic packing for engines and other machinery. The principal place of business is in Sacramento, and the directors are George R. Tuttle, Joseph F. Fenton, A. D. Fenton, Joseph D. Cornell and Harold P. Curtis, all of Sacramento.

The Plant City Foundry & Machine Co., Plant City, Fla., boilers, locomotives, etc., has been chartered with $10,000 capital stock, and has these officers: President, C. A. Root; Plant City; treasurer, William Schneide; secretary and general manager, George Randall, Lakeland, Fla. The company will manufacture boilers, repair locomotives, etc.

New Construction:—

John C. Sharp, Chattanooga, Tenn., has awarded a contract for the construction of a brass foundry building at Twentieth and Boyce streets, 25 x 100 feet, estimated to cost $1,250.

The Appleton Mfg. Co., Batavia, Ill., has installed some new machinery in the steel department, including shears for cutting and trimming iron and steel sheets.

A building permit has been granted the Northwestern Woven Wire Works for a factory building estimated to cost $16,000, at Thirtieth and Clark streets, Milwaukee, Wis.

The Screw Cutting Co. of America, Philadelphia, has let the contract for a two-story building, 60 x 82 feet, estimated to cost $11,000, at Seventh and Sedgley avenue.

The Virginia Iron, Coal & Coke Co. has under way considerable construction on a new mining plant at Crossbrook, Ky., including a number of coke ovens. When mining is begun in the early spring, it is proposed to commence burning coke at this point.

The St. John's River Terminal Co. will shortly begin the construction of new shops at Springfield, Fla., which will double the force of skilled mechanics now at work in the local shops at Springfield.

William H. Thompson has purchased a factory site 49 x 200 feet at 1513 Michigan street, Buffalo, upon which he will erect a two-story brick

factory building to be used for the manufacture of steel furniture.

A complete installation of Northern foundry equipment has been recently made in the plant of the Auburn Foundry Co., Auburn, Ind., consisting of elevator, cupola, tumblers, trucks, etc.

The Northern Pacific Railroad, which is constructing machine shops near Billings, Mont., has signed a contract with the Billings & Eastern Montana Power Co., whereby it purchases electrical power to operate the new works, as soon as completed.

The Republic Iron and Steel Co. has awarded a contract for 50 additional employes' houses to be built at its ore mines at Bessemer, Ala., the work to commence after the holidays. Other improvements are being made by the company at that point, including the construction of a steel tipple.

The new plant of the United Wire Fence Co., Port Huron, Mich., has just been accepted by the officers of the company after an inspection. The plant is built in two sections, the first 48 x 132 feet, and the second 30 x 132 feet. The machinery is being placed as fast as received.

Work on the new machine shop of the Ohio works plant of the Carnegie Steel Co., Youngstown, O., is being completed around the old shop without interruption to operations. It is a steel structure about three times as large as the old shop about which it was built.

The Enterprise Foundry Co., Muskegon, Mich., has begun the work of raising the roof of the plant 12 feet, and installing a 15-ton Shaw electric traveling crane. The regular work of the company is not being interfered with while the improvements are being made.

The Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., is planning extensive improvements to its No. 3 blast furnace, including the construction of three new stoves, 20 x 78 feet, new hearth jackets, tuyere jackets, etc., together with relining the furnaces. The improvements, it is estimated, will cost $120,000.

The Youngstown Iron & Steel Roofing Co., Youngstown, O., has been given a building permit for a fireproof structure to replace its roofing plant, destroyed by fire several weeks ago. The building will be of iron and steel and will be built on Wilson avenue. The estimated cost is given on the permit as $4,000.

The Allyne Brass Foundry Co., Detroit, Mich., has purchased the building and ground formerly occupied by the Ford Motor Car Co., immediately adjoining its site, and will erect additional foundry buildings thereon. The old buildings will be used for the manufacture of plumbers' high grade brass goods.

Schmidt & Harsman, Havana, Ill., have been compelled by increasing business to build a large addition to the south end of their present building, preparatory to the addition of new machinery in the spring. The company builds marine and gasoline engines, and for next season will put out a new four-cylinder, four-cycle engine.

The Engineers Specialty Co., J. George Brinkman president, and James A. Ray secretary, has taken over the Armstrong-Menzer Mold & Metal Co., Kansas City, Mo., and the Ray Purifier Co., Wichita, Kans., and is planning to build a plant for the manufacture of flue cleaners, boiler cleaners, metallic packing and the Ray water purifier.

James Cody & Sons, Peoria, Ill., boiler makers, are planning to take possession of additional quarters in the lower end of the city where a new boiler shop, 82 x 250 feet, will be built for the production of boilers, bridge and structural material. The present plant of the company has been found inadequate to handle the new business that is developing.

The Washington Iron Works, Seattle, Wash., has taken out building permits for making alterations on properties of the company at an estimated cost of $34,500. This is in line with the plans of the iron works for enlarging its plant after Jan. 1. About $60,000 will be expended in building a foundry and boiler shop and making other improvements.

The G. W. Fleming Co., Inc., machinist and founder, Bradford, Pa., advises that it is planning to extend its foundry building to permit of enlarging its brass foundry. It does not expect to purchase any new factory equipment, but the new addition is simply to provide floor space. It will, however, make some addition to the brass working department in the machine shop.

The Delphos Mfg. Co., Delphos, O., has installed a 100 horsepower double cylinder gas engine, in addition to two other engines which have all been assembled in one room. Dynamos will be installed and motors placed in every department to which the power will be distributed. Additional machinery has been ordered for delivery early in the spring for the manufacture of pressed ceiling.

The Johnson Traction Engine Co. has purchased a nine-acre tract near Sunnyvale, Cal., where it will construct its new plant. The machine shops will be 60 x 250 feet, and the foundry 60 x 280 feet. Other buildings include offices and warehouses. Construction, which has been begun at the plant, will be completed in four months, and the expenditure for the buildings and equipment, etc., is estimated to be about $40,000.

The directors of the York Mfg. Co., York, Pa., at a recent meeting, decided to build a new machine shop, three stories high, on a piece of land fronting 100 feet on West Philadelphia street and 230 feet deep, which has just been purchased. The new machine shop with machinery will cost about $100,000. It will be connected with the main plant of the company at the rear. The building will be of steel, concrete and brick, and will have a floor space of 50,000 square feet.

The O. K. Champion Potato Machinery Co., Hammond, Ind., is completing the erection of a plant of re-inforced concrete construction throughout, covering about two acres of ground. The buildings are two stories in height, the roof itself being of concrete. President Otto Knoerzer advises that business prospects in the new year are better than ever and that when the new plant is started in a month or six weeks, he expects to have enough business in sight to keep the plant running steadily.

General Industrial:—

The San Antonio Machinery & Supply Co., San Antonio, Tex., has increased its capital stock to $250,000 from $150,000.

The Multiplex Concrete Machinery Co., Toledo, has filed notice of its increase of capital stock from $20,000 to $45,000.

The Burrell Bridge & Construction Co. has been awarded the contract for the construction of the Higgens avenue bridge at Missoula, Mont., for $134,716.25.

The Leader Foundry Co., Quincy, Ill., has changed its corporate name to The Leader Foundry & Machine Co., and has increased its capital from $15,000 to $25,000.

In an action brought by a stockholder of the American & British Mfg. Co., New Britain, Conn., the Appellate Division of the Supreme Court has ruled that a domestic corporation cannot arbitrarily reduce its

capitalization and the voting power of its stock, where there is both common and preferred, unless by the reduction the voting power of every share is preserved on the original basis. The company's original capitalization, $8,000,000 common and $2,000,000 preferred, was cut in April, 1907, to $1,000,000 common and $1,000,000 preferred.

The American Diesel Machine Co., New York City, has been made defendent in an involuntary bankruptcy action filed in the United States district court. A receiver has been appointed.

John F. Elwell, of Minneapolis, has opened offices at 208 Rookery building, Spokane, Wash., and is considering the establishment of a factory for the manufacture of gasoline engines.

Upon the petition of a majority of the board of directors of the National Corundum Wheel Co., Buffalo, for a voluntary dissolution of the company, Henry P. Hauch has been appointed receiver. The hearing of creditors will be held Jan. 30.

The Independent Foundry Co., Portland, Ore., has secured contracts for the castings for the foundation footings, post caps, bases, etc., for the C. K. Henry building and the Swift & Co. packing plant at Portland.

The final report in the bankruptcy matter in the Weber Foundry Co., Cincinnati, has been filed by the referee in bankruptcy. Creditors received two dividends, aggregating 29 per cent. The plant was sold some time ago, at auction, to Wessling Bros. for $15,000.

The current report that the appropriation has been made and that construction work will soon begin upon two additional merchant mills at the Duquesne works of the Carnegie Steel Co., is not officially confirmed. No definite action has been taken on any improvements that may be made in the future.

The Pratt Engineering & Machine Co., Atlanta, Ga., which was recently incorporated with a capital stock of $700,000, has purchased the machine manufacturing plant of the N. P. Pratt Laboratory. N. P. Pratt will continue as president and George L. Pratt vice president.

The York Safe & Lock Works, York, Pa., is completing a 400-ton vault, 30 feet long and 28 feet wide with a body of 4-inch diameter steel, to be placed in the new First National Bank building, Youngstown, O. It is equipped with a double combination time lock. The front is made of 15-inch alternate tempered and soft steel. Eight freight cars will be required to convey the vault to Youngstown.

The National Iron Works, Spokane, advises: "We have given out no information which would indicate that we are about to make alterations in our foundry to the extent of $2,000, and such report is unfounded. We may possibly make some alterations, but this depends entirely upon future requirements."

The Columbus Bolt Works, Columbus, O., advises that press reports of its recent fire were exaaggerated, it being entirely confined to the machine shop of its forge department, the damage having been entirely repaired. It has resumed operating this department, and is now running as usual.

The Remington Tool Machine Co., Boston, has taken an option on a piece of land at Lynn, Mass., with the ultimate design of locating with a modern two-story fireproof factory building in the latter city. The company manufactures fine precision tools and machines with an extensive foreign and domestic sale.

The Seattle office of the American Steel & Wire Co. advises that although negotiations were once under way for the purchase of the northwest corner of Occidental avenue and Kind street, Seattle, for the erection of a new warehouse, the property has not been purchased and no warehouse will be built in the immediate future.

The Acme Machine Tool Co., Cincinnati, which was recently incorporated with a capital stock of $100,000, by C. H. M. Atkins, E. M. Atkins, J. H. Williams, B. B. Quillen and W. H. Burtner, will occupy the old plant of the Cincinnati Planer Machine Co., and will take possession as soon as the Planer Machine company is installed in its new building on Oakley.

Trade Notes:—

E. N. Breitung & Co., organized to deal in Lake Superior iron ores, as heretofore announced in these columns, have opened an office at 217-19 Rockefeller building, Cleveland. G. F. Knapp is in charge.

Frantz Djorup, of 349 Washington boulevard, Chicago, has been appointed exclusive representative for the United States in the sale of electrically melted Styrian tool steel manufactured by Danner & Co., Austria.

The Riter-Conley Mfg. Co. has completed arrangements for the opening of additional branch offices at St. Louis and Seattle after Jan. 1. W. H. Dickinson will have charge of the Seattle, and H. B. Clarke of the St. Louis offices.

The Reynolds Machine Co., formerly located at Rock Island, Ill., advises that after Dec. 26, it will be located at Moline, Ill., where in addition to its present line of power screw driving machines it will manufacture the simplest hobbing spur gear cutter.

The Whiting Foundry Equipment Co. advises that it has appointed the following agents: The United States Steel & Equipment Co., Seattle, for Vancouver, Portland, and the state of Washington for cupola furnaces, equipment, etc.; Gorman, Clancy & Grindley, Ltd., Calgary, Alberta, B. C., for the province of Alberta and the southwestern corner of British Columbia,, for its cupola and foundry equipment and cranes.

Fires:—

The plant of the Meech Foundry Co., Newburg, O., was badly damaged Dec. 25, the loss being placed at $6,000, partly covered by insurance. About $500 worth of stove casting patterns were destroyed.

TRADE PUBLICATIONS.

SASH OPERATING APPARATUS.—The Lord & Burnham Co., Irvington-on-Hudson, New York, is distributing catalog No. 6, illustrating the sash operating apparatus manufactured by it. This apparatus is designed to open swinging sashes as applied in monitors, clere stories and other locations. Photographs of actual installations are given, together with details of construction and operation and general information regarding the system. The catalog comprises 48 8 x 10-inch pages.

AIR COMPRESSORS.—The National Brake & Electric Co., Milwaukee, is distributing publication No. 386, entitled, "Air Compressors for Industrial Service." This catalog comprises 24 6 x 9-inch pages, and lists a line of motor-driven, portable and stationary compressors of both the horizontal and vertical types, ranging in capacity from 10 to 450 cubic feet per minute. Installations are also shown comprising a compressor and water pumping outfits used in connection with automatic sprinkler and hydraulic elevator systems.

ELECTRICAL MACHINERY.—The Fort Wayne Electric Works, Fort Wayne, Ind., in Bulletin 1109 describes multi-phase, revolving field, engine-driven alternators for general service. It has also issued publication 5016, entitled, "Transformer Testing." This publication is a practical guide for the testing of transformers in central stations and gives rules, connection diagrams, formulae and curves for making all the tests necessary on transformers.

BOILER ACCESSORIES.—The Mayville Specialty Mfg. Co., Mayville, Wis., is distributing a bulletin describing the Monarch patented fire door and back combustion chamber arches for steam boilers. The arch consists of a metallic backing with a facing of fire brick, which forms a durable construction and one which permits of easy inspection.

GENERAL LIBRARY
UNIV. OF MICH.
DEC 31 1908

IN THIS ISSUE: The Bray Continuous Sheet Mill—Some Interesting Machine Tools.

THE IRON TRADE REVIEW

A Weekly Journal Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades.

Volume XLIII—No. 27. CLEVELAND, DECEMBER 31, 1908. Three Dollars a Year. Single Copies Ten Cents

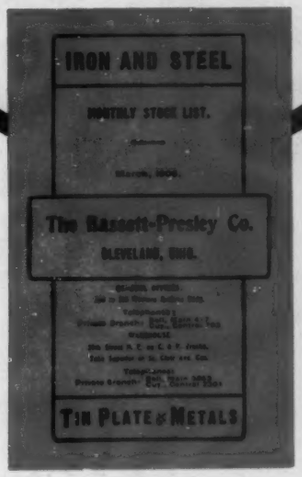
Copyright, 1908, by Penton Pub. Co.

WE WISH YOU A PROSPEROUS NEW YEAR

IMMEDIATE SHIPMENTS OF ANYTHING IN

IRON AND STEEL

If our Monthly Stock List is not on your desk ask for it--Free to you.



SEE PAGE No. 7 EACH WEEK FOR OUR ADVERTISEMENT

AGENTS FOR
COLONIAL TOOL STEEL
READING IRON CO.'S BOILER TUBES PIPE

IRON STEEL TIN PLATE

THE BASSETT-PRESLEY CO.
CLEVELAND, OHIO

Classified Index for Buyers Page 80

Chicago Drop Forge & Fdry Co.

DROP FORGINGS

OF ALL KINDS

WORKS ESTABLISHED 1880

38 minutes south of Chicago by Ill. Central R. R. Suburban trains

KENSINGTON, ILL.

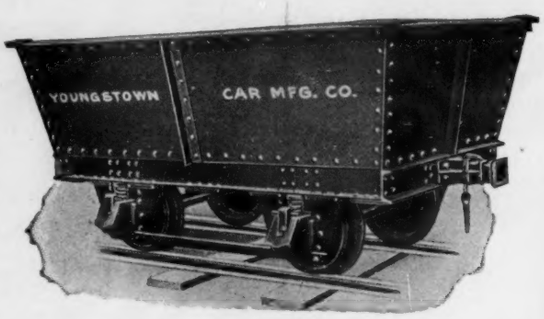
TURNBUCKLES

Cleveland City Forge & Iron Company

CLEVELAND, OHIO.

CLEVIS NUTS

MILL CARS



WE recently built a shop truck weighing 300 lbs. The next day we shipped an ingot car weighing 11 tons. This serves to indicate the range of our capacity.

If it's anything in the industrial car line, we build it.

THE YOUNGSTOWN CAR MFG. CO.

Youngstown, Ohio

New York, 90 West St. Pittsburgh, 406 House Bldg. Chicago, 934 Monadnock Bldg.

Everything in Iron, Steel and Metal Working Machinery

ROOFING AND SIDING

Galvanized and Painted

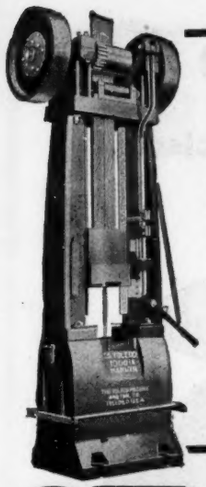
Stock and Mill Shipments.

Write us for latest Lists.

The Cincinnati Iron & Steel Co.

Cincinnati, Ohio

Case Electric Cranes



"You Want the Best—Buy of Us."

"Toledo" **"Toledo"**

Forging Hammers are equipped with a Patented Controlling Mechanism for Vertical Friction Bar which is the QUICKEST ACTING and Least Noisy Device in Use.

Trimming Presses are fitted with Long Stroke and other advantageous features. Cover wide range of work. Occupy minimum floor space. Built in all sizes.

Investigate ***Investigate***

Investigation into "TOLEDO" claims costs nothing.

THE TOLEDO MACHINE AND TOOL CO.

TOLEDO, OHIO, U. S. A.

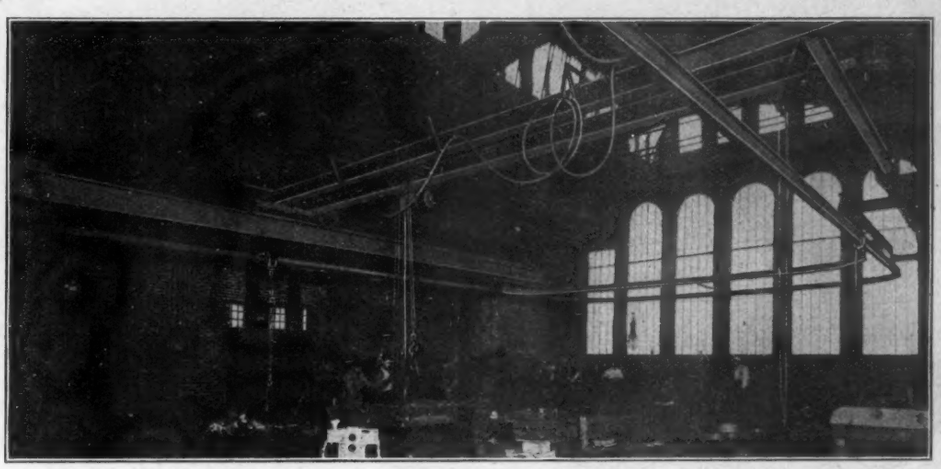
AGENTS: Ludw. Loewe & Co., Berlin, Germany.
Selig, Sonnenthal & Co., 85 Queen Victoria St., London, England.

SUPPLIES

FOUNDRY ENGINEERS

Trolley Systems---Hand Power Cranes---Trolleys---Hoists

We designed, built and installed this equipment

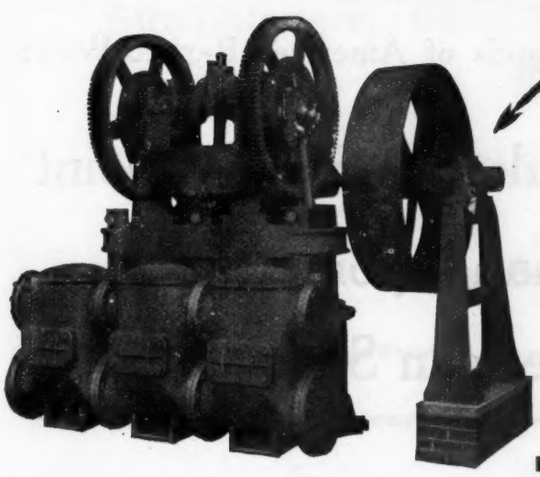


EQUIPMENT

CORE OVEN EXPERTS

The J. D. Smith Foundry Supply Co.

CLEVELAND - - OHIO.



The Solution of
All Pump Troubles

Is indicated by the arrow.

Hundreds of pump users in the last year have reduced their operating costs by the installation of a direct connected or belt driven **DEMING TRIPLEX POWER PUMP** and are now entirely free from the troubles caused by unreliable outfits.

If you want to get "the best there is" in the pump line, state your conditions and we will give you our advice.

THE DEMING CO.

SALEM, OHIO

HENION & HUBBELL, 61-69 North Jefferson St., Chicago
Other agencies in principal cities.

American Steel & Wire Co.

Chicago **New York** **Denver** **San Francisco**

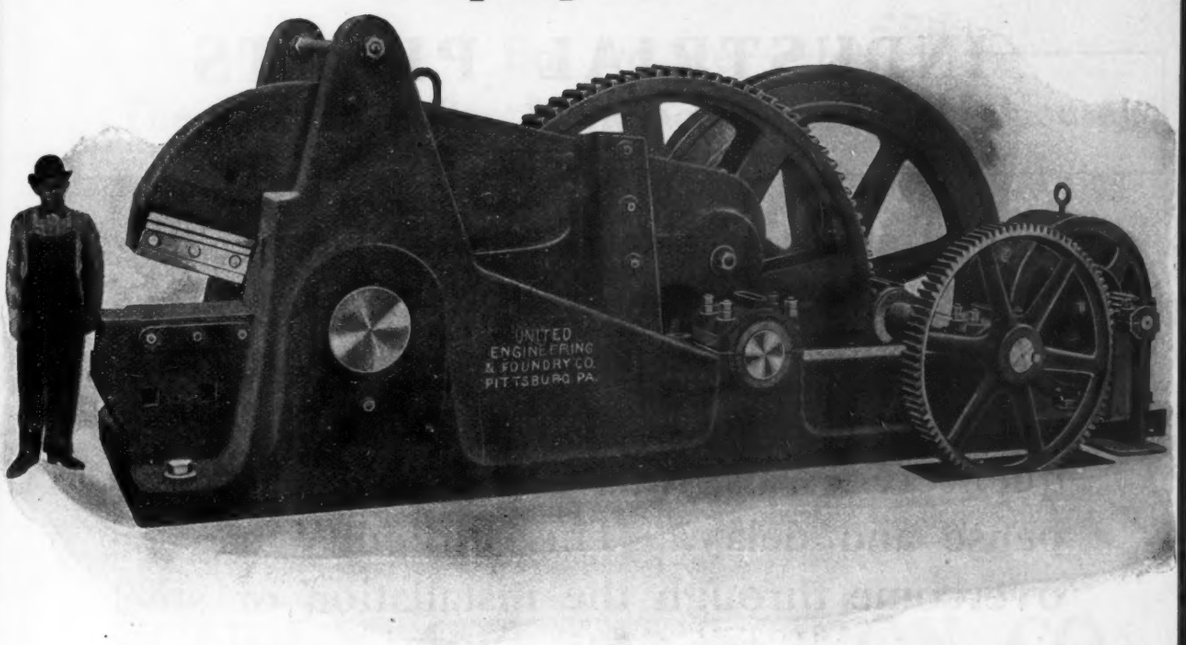
Makers of the following old-established brands of American Barbed Wire:

Joliet Glidden	Waukegan 2 and 4-point
Ellwood Glidden	Lyman 4-point
Baker Perfect	American Special

UNITED ENGINEERING & FOUNDRY CO.

Every facility for designing
manufacturing and installing

Iron, Steel and Tube Works Equipment



No. 7 Lever Shear, Motor Driven

Hydraulic and Electrically Driven Shears, Punches, Straighteners, Mills, Tables, Sand, Chilled & Steel

ROLLS

Brass Castings and Bronze Bearings for Mill Work

General Offices

FARMERS BANK BUILDING,
PITTSBURG, PA.

Largest Roll Makers in the World **Makers of the Largest Rolls**

Carnegie Steel Company

Pittsburg, Pa.

STEEL CROSS TIES

For

INDUSTRIAL PLANTS

In and about steel producing plants, rolling mills and blast furnaces wooden ties are continually burning out from the dropping of hot cinders and hot metal, calling for frequent renewals, thus involving heavy expense and delay. This difficulty can be overcome through the installation of steel ties, which under similar conditions will outlast eight or ten wooden ties.

For information write any of our offices.

Birmingham	Cincinnati	New Orleans	Portland
Boston	Cleveland	New York	San Francisco
Buffalo	Denver	Philadelphia	St. Louis
Chicago	Detroit	Pittsburg	St. Paul

INLAND STEEL COMPANY
CHICAGO

OPEN HEARTH STEEL

Merchant Bars, Rounds, Squares, Flats, Ovals, Half Ovals
Universal Plates, to 18 x 1 1/4 inches
Merchant Angles, 3/4 x 3/4 to 2 1/2 x 2 1/2 inches
Structural Angles, 3 x 2 to 7 x 3 1/2 inches
Channels, 5 to 13 inches. I Beams, 5 to 8 inches

WORKS: INDIANA HARBOR, IND. CHICAGO HEIGHTS, ILL.

We neither manufacture nor sell boilers

But we are

The Largest Boiler Manufacturers' Supply House in America

We Offer **Everything You Need** From Chalk for the Layer-out to huge Hydraulic Riveters and Flange Presses. And we are just as polite in filling an order for a Calking Tool as we are in furnishing a $25,000 shop equipment.

We are undoubted Headquarters for Boiler Plates, Sheets, Bars, Rivets, Structural Steel, Boiler Tubes, Etc.

Is our Blue Book on your desk?

SCULLY STEEL & IRON CO.,

Chicago, Ill.

The Highland Iron & Steel Co.
MAIN OFFICE AND WORKS
TERRE HAUTE, IND.

Manufacturers of
BAR IRON AND STEEL

CHICAGO AGENTS
H. L. GREEN & CO.
Ogden Bldg. Lake & Clark Sts.

JONES & LAUGHLIN STEEL COMPANY

American Iron & Steel Works,
PITTSBURGH, PA.

OPEN HEARTH AND BESSEMER

STEEL

Billets Blooms Slabs Beams
Channels Angles Tees Plates
Bars Light Rails
Cold Twisted Bars Spikes
Rivets Chain Chain Rods
Cold Rolled Shafting Pulleys
Hangers
Pillow Blocks Collars Etc.

Prompt Shipments

General Offices
PITTSBURGH

Branch Office and Warehouse
CHICAGO

District Sales Offices

Atlanta	Boston	Buffalo	Cincinnati
Cleveland	Detroit	New Orleans	New York
Philadelphia	San Francisco	St. Louis	

THE BEST PROTECTION

obtainable in sheet metal construction is found in

AMERICAN SHEET & TIN PLATE CO. APOLLO BEST BLOOM TRADE MARK REGISTERED

PITTSBURGH

APOLLO BEST BLOOM

Galvanized Sheets

"A PRODUCT WITHOUT A PEER"

On all classes of buildings, in various kinds of work—skylight, cornice, gable, siding or roofing, culverts—Apollo Best Bloom Galvanized Sheets are the most dependable when it comes to efficient service and satisfactory results. Important jobbers everywhere sell them—a strong commendation in itself.

Send for an Apollo Weight Card, giving sizes, gauges and weights of galvanized sheets—it is free for the asking.

AMERICAN
SHEET AND TIN PLATE
COMPANY,

FRICK BUILDING PITTSBURGH, PA.

OPEN HEARTH SHEET STEEL

BLACK and GALVANIZED FOR ALL USES

ROOFING OF ALL KINDS

EXTRA SOFT INLAND OPEN HEARTH

INLAND STEEL CO. CHICAGO

¼ inch to No. 30

WORKS
INDIANA HARBOR, IND.
CHICAGO HEIGHTS, ILL.

SENECA IRON & STEEL COMPANY

STEEL SHEETS

Black, Galvanized, Corrugated

BUFFALO, N. Y.

Seneca Brand Stands For Quality

LACKAWANNA STEEL SHEET PILING

The photographs reproduced on this page show an installation of the Lackawanna Steel Sheet Piling by Messrs. Scott Brothers, General Contractors, now at work on Barge Canal Contract No. 45, at Baldwinsville, New York. It was the original intention of the Contractors to use wooden piling, having some doubts as to whether steel piling could be made watertight. They finally decided to install the Lackawanna Steel Piling and it will be seen from the photographs that the channel is well contained and the use of the steel piling proved a success in every particular, the Contractors writing as follows:

"With five to six feet of water behind the piling

it holds almost like a bucket."

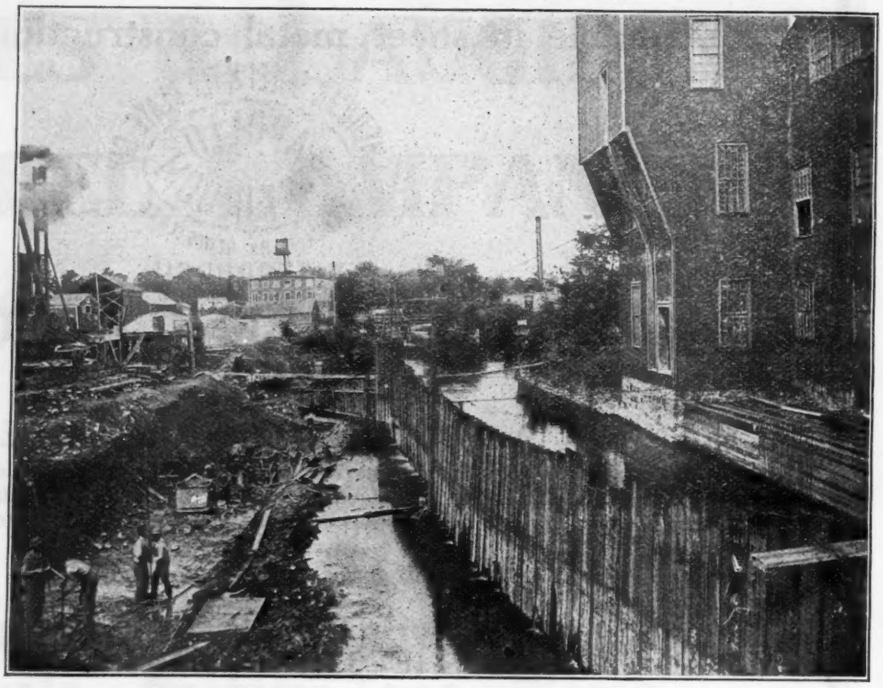
Also writing a little later on they say:

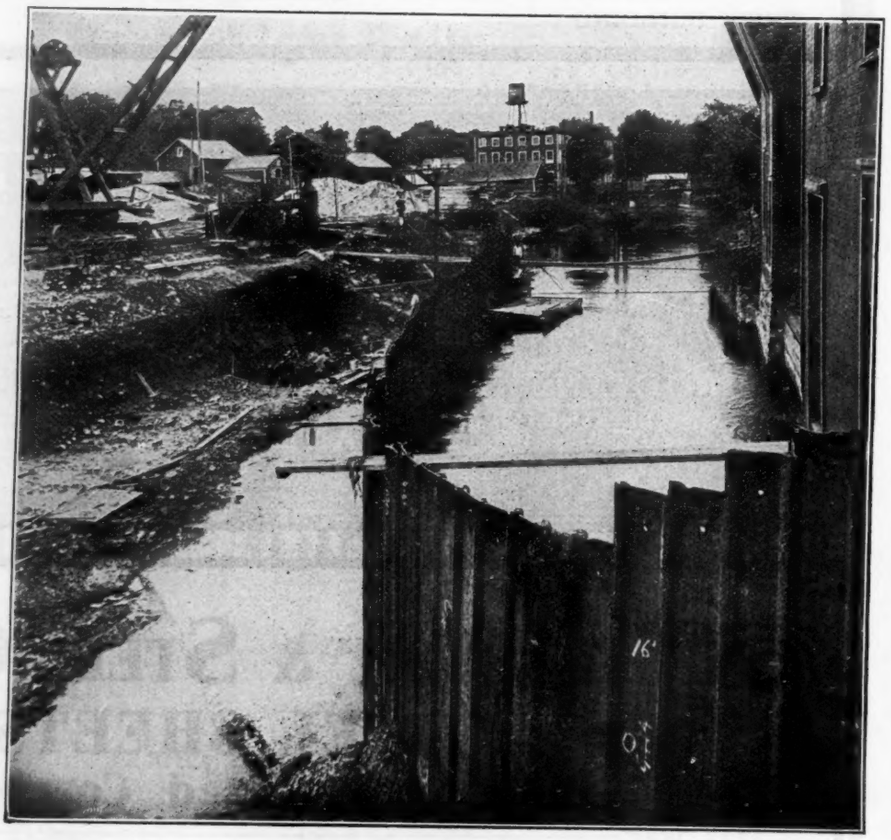
"Since writing you before we have been using considerable dynamite in blasting out the foundation and

there are no perceptible leaks

from the use of explosives close to the coffer-dam."

The successful use of steel piling on this work is positive proof of its adaptability and economy on any similar work throughout the country for dams, harbor and river improvement, excavations, etc. It also has the added advantage that whereas wooden piling is practically destroyed after being once driven, the steel piling can be withdrawn and driven over and over again and finally possesses a very considerable scrap value.





This wall of Lackawanna Steel Sheet Piling is holding back 6' 4" of clear water.

LACKAWANNA STEEL COMPANY

WORKS: BUFFALO, N. Y. **General Sales Office: 2 RECTOR STREET, NEW YORK**

J. H. HILLMAN & SON

FRICK BUILDING

PITTSBURGH, PA.

STANDARD
LOW SULPHUR
CONNELLSVILLE COKE

FOR

BLAST FURNACES AND FOUNDRIES

DAILY SHIPMENTS 5000 TONS

ANY RAILROAD DELIVERY

AFTER THIRTY ODD YEARS'

experience, a prominent roofer of Philadelphia writes:

Gentlemen:

I have used your plates of all coatings, particularly those carrying 30 lb. and 40 lb. to the box, and have absolutely no complaint whatever to make.

I have been a metal roofer for thirty odd years and still apply my roofing as I did when I first began my trade, and find the quality and durability of your plates to be equal to those of the imported plates.

The *Old Fashioned Method* of applying metal roofing, if followed at this date, would be productive of "old time" results in wearing quality. The principal causes for the condemnation of metal roofing to-day would be eliminated if metal roofs were laid on absolutely dry and seasoned boards with no cracks nor crevices through which dampness nor gases could penetrate—By the elimination of all acids as a soldering flux—By using nothing but absolutely pure metallic paint for both sides, the same to be mixed with pure linseed oil and allowed to become thoroughly dry and hard before laying the roof.

Very truly yours,

Philadelphia, Pa. Joseph Donnell.

AMERICAN SHEET AND TIN PLATE COMPANY

Tin and Terne Plate

FRICK BUILDING **PITTSBURGH, PA.**

Republic Iron & Steel Company

GENERAL OFFICES, Frick Building Annex, PITTSBURG, PA.

MANUFACTURERS OF

BAR STEEL BAR IRON
POLISHED STEEL SHAFTING

BESSEMER STEEL RAILS
ANGLES, CHANNELS, TEES, U BARS, PLOW BEAMS
AND SPECIAL SECTIONS FOR AGRICULTURAL IMPLEMENT
WIND MILL AND BEDSTEAD MAKERS

SPIKES, TURNBUCKLES
BOLTS, NUTS, TIE RODS AND CROSS ARM BRACES

Bessemer and Open Hearth Steel Billets
Slabs, Sheet Bars, Skelp

PIG IRON
NORTHERN FOUNDRY, SAND AND CHILLED BESSEMER
SOUTHERN FOUNDRY AND BASIC **"PIONEER"** IRON

SALES OFFICES

Chicago New York Cleveland Cincinnati St. Louis
Birmingham St. Paul Denver Pittsburg

EDMUND W. MUDGE & CO.

Pig Iron, Steel and Coke

General Offices, Frick Building, Pittsburgh, Pa.

IRON AND STEEL SCRAP

Special attention paid to Steel Scrap suitable for use in Both Basic and Acid open hearth Furnaces

Monthly Stock List
tells the whole story.
Want it?

We are the people to consult if it is a question of dollars on the purchase.

THE
Globe Rolling Mill Co.

CINCINNATI
OHIO

TUBES
SHEETS
PLATES
STEEL TIRES

Modern facilities enable us to deliver any quantity—any size, at any time. Our customers know this—from others we solicit a trial order. Let our name be first in your mind when ordering.

BARS
BEAMS
ANGLES
CHANNELS

30,000 Tons Steel

Regularly on hand for immediate shipment, in the warehouses of the Illinois Steel Co.'s

NORTH WORKS

Principal Stock Sizes are as follows:

ANGLES

¼" x ¼" x ⅛"
1" x 1" x ⅛" 3/16"
1¼" x 1¼" x ⅛" 3/16" ¼"
1½" x 1½" x ⅛" 3/16" ¼"
1¾" x 1¾" x 3/16" ¼"
2" x 1½" x 3/16"
2" x 2" x 3/16" ¼" 5/16" ⅜"
2¼" x 2¼" x ¼" 5/16"
2½" x 2" x 3/16" ¼" 5/16" ⅜"
2½" x 2½" x 3/16" ¼" 5/16" ⅜"
3" x 2" x ¼" 5/16" ⅜"
3" x 2½" x ¼" 5/16" ⅜"
3" x 3" x ¼" 5/16" ⅜" 7/16" ½"
3½" x 2½" x ¼" 5/16" ⅜" ½"
3½" x 3" x 5/16" ⅜" ½"
3½" x 3½" x 5/16" ⅜" 7/16" ½"
4" x 3" x 5/16" ⅜" 7/16" ½"
4" x 4" x 5/16" ⅜" 7/16" ½" ⅝" ¾"
5" x 3 " x 5/16" ⅜" ½"
5" x 3½" x 5/16" ⅜" 7/16" ½" ⅝"
5" x 5" x ⅜" ½" ⅝"
6" x 3½" x ⅜" ½" ⅝"
6" x 4" x ⅜" 7/16" ½" ⅝" ¾"
6" x 6" x ⅜" 7/16" ½" 9/16" ⅝" ¾" ⅞"
8" x 8" x ½" ¾" ⅞"

BEAMS

3"—5½ and 7½ lb.
4"—7½ and 10½ lb.
5"—9¾, 12¼, and 14¾ lb.
6"—12¼, 14¾, and 17¼ lb.
7"—15, 17½, and 20 lb.
8"—18, 20½, 23, and 25½ lb.
9"—21, 25, 30, and 35 lb.
10"—25, 30, 35, and 40 lb.
12"—31½, 35, 40, 45, 50, and 55 lb.
15"—42, 50, 60, 70, and 80 lb.
18"—55 and 70 lb.
20"—65, 80, and 100 lb.
24"—80 and 100 lb.

CHANNELS

3"—4 and 6 lb.
4"—5¼, 6¼, and 7¼ lb.
5"—6½, 9, and 11½ lb.
6"—8, 10½, 13, and 15½ lb.
7"—9¾, 12¼, 14¾, 17¼, and 19¾ lb.
8"—11¼, 13¾, 16¼, 18¾, and 21¼ lb.
9"—13¼, 15, 20, and 25 lb.
10"—15, 20, 25, 30, and 35 lb.
12"—20½, 25, 30, 35, and 40 lb.
13"—32 lb.
15"—33, 40, 45, 50, and 55 lb.

PLATES

7" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾" 1"
8" x ¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1"
8½" x 3/16"
9" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾" 1"
10" x ¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1"
12" x ¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1"
14" x ¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1"
16" x ¼" 5/16" ⅜" ½" 9/16" ⅝" ¾" 1"
18" x ¼" 5/16" ⅜" ½" ⅝" ¾"
20" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾" 1"
22" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾"
24" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾" 1"
26" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾"
28" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾"
30" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾" 1"
36" x 3/16" ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾"
42" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾"
48" x 3/16" ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾"
60" x 3/16" ¼" 5/16" ⅜" ½" ⅝" ¾" ⅞" 1"
72" x ¼" 5/16" ⅜" ½"

BLUE ANNEALED SHEETS

No. 16, 36," 48," 54."
No. 10, 36," 48," 60."

CHECKERED PLATES

34" x 5/16" ⅜" ½"

RAILS AND SPLICES

12, 16, 20, 25, 30, 45, 60, 75, and 90 lb.

RIVET RODS

½" ⅝" ¾" ⅞" 1"

RIVETS

½" ⅝" ¾" ⅞" 1"

ZEES

3" x ¼" 5/16" ⅜"
4" x ¼" 5/16" ⅜" 7/16" ½"
5" x 5/16" ⅜" 7/16" ½"
6" x ⅜" 7/16" ½"

TEES

1" x 1" x ⅛"
1¼" x 1¼" x 3/16"
1½" x 1½" x 3/16"
1¾" x 1¾" x ¼"
2" x 2" x ¼"
2¼" x 2¼" x ¼"
2½" x 2½" x 5/16"
3" x 3" x 5/16" ⅜"
3½" x 3" x ⅜"
3½" x 3½" x ⅜" ½"
4" x 4" x ½"
4" x 5" x ⅜" ½"

FLATS

1" x 3/16" ½"
1¼" x 3/16" ¼"
1½" x 3/16" ¼" 5/16" ⅜" ½" ⅝"
1¾" x ¼" 5/16" ⅜"
2" x 3/16" ¼" 5/16" ⅜" ½" ⅝" ¾"
2¼" x ¼" 5/16" ⅜" ½" ¾"
2½" x ¼" 5/16" ⅜" ½" ⅝" ¾"
3" x ¼" 5/16" ⅜" 7/16" ½" ⅝" ¾" 1"
3½" x 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1"
4" x ¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1" 1¼"
5" x ¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1"
6" x ¼" 5/16" ⅜" 7/16" ½" 9/16" ⅝" ¾" 1"

ROUNDS

½" ⅝" ¾" ⅞" 1" 1⅛" 1¼" 1⅜" 1½"
1⅝" 1¾" 1⅞" 2" 2¼" 2½" 2¾" 3"
3¼" 3½" 3¾" 4" 4¼" 4½" 4¾" 5"

SQUARES

½" ⅝" ¾" ⅞" 1" 1¼" 1½" 1¾" 2"
2¼" 2½" 2¾" 3" 3¼" 3½" 3¾" 4"

Address

NORTH WORKS, CHICAGO

CUT NAILS

All sizes and of quality to meet all requirements—Prompt Shipment.

ALSO

Basic Pig Iron, Open Hearth Steel Slabs, Sheet Bars, Universal Plates, Sheared Plates, Skelp, Pipe, Black and Galvanized Steel Sheets.

Our own ore is the basis of our nails and this, with the experience of more than half a century in their manufacture, insures uniformity of quality.

LA BELLE IRON WORKS

Established in 1852

Steubenville, Ohio

CORRUGATED ROOFINGS

FLAT GALVANIZED SHEETS

Quality Guaranteed

A large assortment of standard sizes always in stock for immediate shipment

THE NILES IRON & STEEL CO.

Niles, Ohio

The Empire Iron & Steel Company

NILES, OHIO

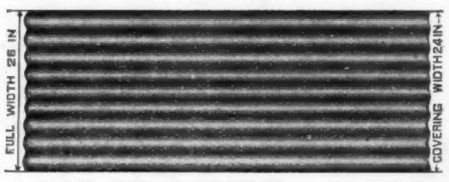
Manufacturers of

BLACK AND GALVANIZED
WROUGHT IRON AND STEEL SHEETS
CORRUGATED ROOFING AND SIDING

Pure Wrought Iron Sheets and Roofing Our Specialty

Corrugated Roofing

Made Under the Edwards Patent



ALSO SKYLIGHT CONSTRUCTION

Can be applied on purlins without rivets.
The Ideal Fire-proof Roof Covering for Factories, Foundries, Warehouses, Railroad Sheds, Auditoriums, Public Buildings, etc.

Write for catalog No. 37.

The Edwards Manufacturing Co.

"The Sheet Metal Folks"
IRON AND STEEL

Main Offices and Factory 401 to 417 Culvert St.
CINCINNATI, OHIO.

American Iron and Steel Manufacturing Company

General Office—Lebanon, Pennsylvania, U. S. A.

Rolling Mills and Factories located at Reading and Lebanon, Pennsylvania.

Manufacturers of

Refined Merchant Bar Iron,
Boiler, Tank, Bridge and Ship Rivets,

Bolts, Nuts, Washers, Lag Screws, Turnbuckles, Harvey Patent Grip Thread Track Bolts, Soft Steel Bolts with Cold-pressed Threads, Railroad Spikes, Screw Spikes.

Arch Bars, Draw Bar Yokes and Other Car Forgings, Rods and Irons for Bridges, Buildings, etc.

SALES OFFICES:

Atlanta, Ga., Fourth National Bank Building; Boston, Mass., Oliver Building; Chicago, Ill., The Rookery; New York, N. Y., Postal Telegraph Building; Philadelphia, Pa., Harrison Building; San Francisco, Cal., Crocker Building.

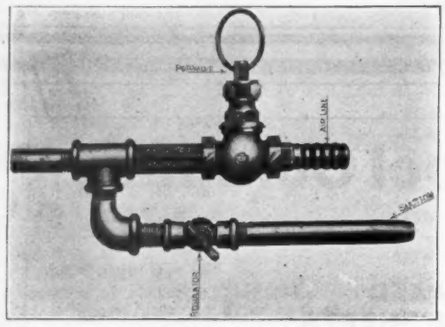
Cable Address: Ambolt, Lebanon. 1

Niagara Devices for PAINTING and SAND BLASTING

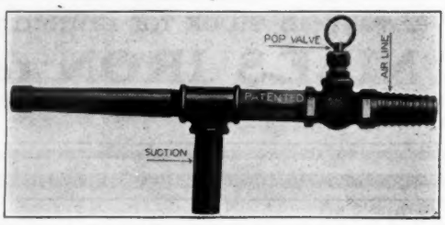
Efficiency--Simplicity--Low Cost

Expressed on 10 days' trial

In use from coast to coast by RAILROAD, CAR, STEEL, SHIP, BOILER, PIPE, STOVE, FOUNDRY and MACHINE shops.



Here's the NIAGARA Paint Spray
See how simple it is
$10.00 F. O. B. Buffalo, N. Y.



NIAGARA Sand Blast.
$15.00 F. O. B. Buffalo, N. Y.

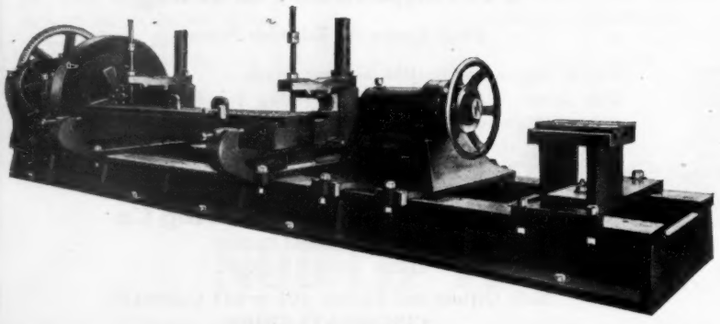
NO TANKS! Illustrations tell the story.
Attach to any air line at a point nearest to work.
Uniform distribution of material.

NO WASTE! Saving on brushes alone soon pays cost.
Reaches parts inaccessible to the brush.
Unskilled labor can operate.

Shops NOT HAVING Compressed Air should write us for information on LOW COST of the "NIAGARA" PNEUMATIC SYSTEM of installation, advising if motor, steam or belt driven equipment is desired

NIAGARA DEVICE COMPANY, Buffalo, N. Y.

Sole Manufacturers of "NIAGARA" Painting and Sand Blast Devices.



ROLL LATHES
ROLLING MILL MACHINERY
Sand Chilled and Steel ROLLS

THE YOUNGSTOWN FOUNDRY & MACHINE CO., Youngstown, O.

WROUGHT STEEL KESCO **FLOOR PLATES**

Diamond, Ribbed and Checkered Pattern

For Floors and Stairways in Buildings, Engine and Boiler Rooms, Breweries, Bridges, Factories, Power Plants, Fire Escapes, Cellar Doors, War and Merchant Vessels.

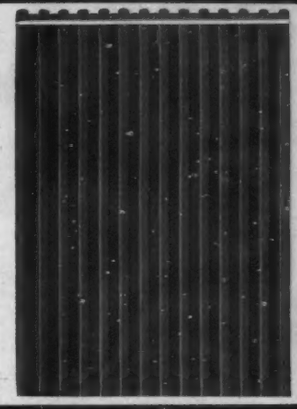
MADE FROM THE FINEST GRADE OF OPEN HEARTH BOILER STEEL

PROMPT SHIPMENT GUARANTEED

KEYSTONE STEEL COMPANY

General and Sales Offices, WARREN, PA.

—Mills— WILMINGTON, DEL.



THE PETROLEUM IRON WORKS CO.

Sharon, Pa.

Manufacture all classes of Steel Plate Construction, such as

Tanks, Stacks,
Blast Furnaces,
Oil Refining Plants,
Riveted Steel Pipe, etc.

Works: Sharon, Pa. Washington, Pa.

Branch Offices: Pittsburgh, Pa. 50 Church St., New York, N. Y. Houston, Texas

PITTSBURGH STEEL CO.

Pittsburgh, Pa.

The Wire Fence YOU Sell Should be Unlike Any Other

On account of the joint, welded by electricity, no fence user will ever mistake "Pittsburgh Perfect" that he sees as he drives along the road for any other make, while none but a well posted fence man can distinguish between the various styles of wrapped or clamped fence. Therefore, every sale you make of "Pittsburgh Perfect" is a sign board for you and you only, and when you call your customers' attention to the great number of points of superiority over any and all of the other wrapped and clamped fences, you are not helping your competitors to sell their fences, but the whole force of your argument goes forth to your individual benefit as far as fence sales in your territory are concerned, because "Pittsburgh Perfect" is the only welded fence.

Barb Wire

Prominent among our brands of barb wire are our "Pittsburgh Perfect," 2-point flat barb; and our "Keystone Glidden," 2-point round barb. We also make 4-point barb wire. All of the above in galvanized or painted, hog or cattle.

Wire Nails

The heads of our nails are well supported by a process of manufacture that is based on a scientific principle of strength. All principal sizes and styles are made on machines which are of the very latest and most approved type.

STEEL PLATE WORK

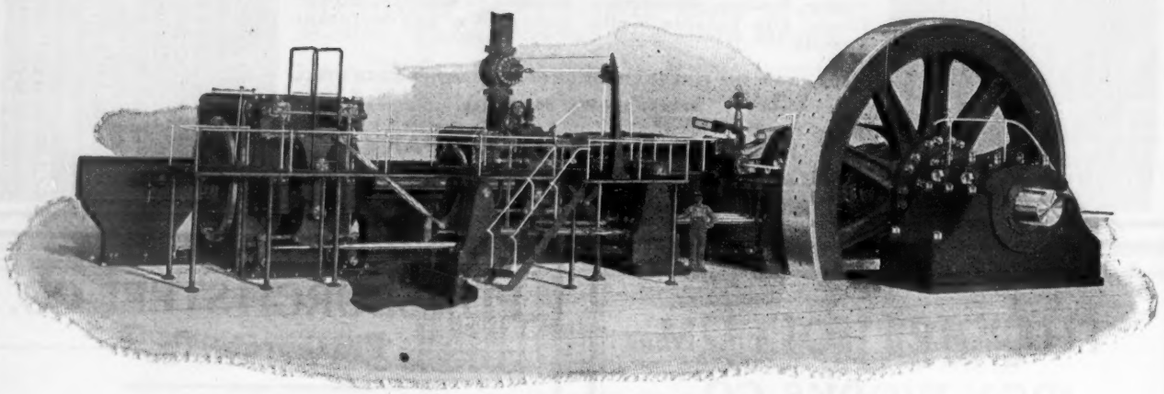
BLAST FURNACE CONSTRUCTION

THE MEEHAN BOILER AND CONSTRUCTION CO.

LOWELLVILLE, OHIO.

THE WILLIAM TOD COMPANY

Youngstown, O.



52″ and 90″ x 60″ Horizontal Tandem Compound Corliss Engine.

THE LARGEST TANDEM COMPOUND ENGINE IN THE WORLD.

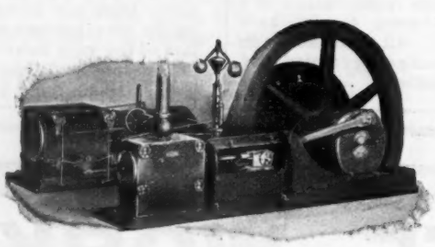
BLOWING ENGINES
REVERSING ENGINES
MILL ENGINES
PUMPING ENGINES
CORLISS ENGINES
GAS ENGINES

5

THE COOPER CORLISS

For all classes of

Rolling Mill Work.



Built by

The C. & G. Cooper Co.

Mt. Vernon, Ohio.

Pittsburg, 604 Frick Bldg. — Philadelphia, Drexel Bldg. — Boston, 411 Weld Bldg.
New York, 1419 Bowling Green Bldg. — Atlanta, Candler Bldg.

THE

GRASSELLI CHEMICAL CO.

CLEVELAND, OHIO.

CHEMICALLY PURE

ACIDS AND AMMONIA

BRANCHES:
CHICAGO - NEW YORK - ST. LOUIS,
ST. PAUL - NEW ORLEANS - CINCINNATI,
MILWAUKEE AND ELSEWHERE.

MESTA MACHINE CO.
PITTSBURG, PA., U.S.A.

Heavy Duty

CORLISS **ENGINES** PISTON VALVE

HELANDER BAROMETRIC CONDENSER

HORIZONTAL DOUBLE-ACTING

Gas Engines

POWER TRANSMISSION MACHINERY

Machine Molded GEARS

Straight, Staggered and Double Helical Teeth

Internal, Mitre, Bevel and Worm Gears of Air Furnace Iron Open Hearth or Nickel Steel

CUT GEARS

ROPE WHEELS

PULLEYS

Machine Molded Steel Gear.

ROLLING MILL EQUIPMENT

Blooming Slabbing, Plate Universal and Finishing Mills

ROLLS

Sand, Chill, Steel Nickel or Vanadium Steel

SHEARS

IRON and STEEL CASTINGS

Mackintosh, Hemphill & Company

PITTSBURG, PA.

ROLLING MILL MACHINERY

ENGINES

HEAVY STEEL CASTINGS

Miscellaneous Machinery for Iron and Steel Works

No proposition too large for us

WISCONSIN ENGINE COMPANY

Corliss, Wisconsin.

Heavy Duty Rolling Mill Engines

Prime Movers for Maximum Economy

Corliss Engines,
Pumping Engines,
"Complete
Expansion"
Gas Engines.

WHEELING MOLD & FOUNDRY CO.

Mills, Shears, Roll Lathes.
Rolls for Sheets, Tin and Plates.
Rough Castings. Ingot Molds.
Induction Reversing Drives.
Rolls.

NEW YORK OFFICE
201 East 16th St.

PITTSBURGH OFFICE
Farmers Bank Bldg.

Special Specification Work
Pumping Engines
Blowing Engines
Gas Engines

RICHARD HAMMOND,
President

LAKE ERIE ENGINEERING WORKS
BUILD THE HIGHEST CLASS ENGINES
OF ANY TYPE FOR SERVICE.
NO ENGINE, MACHINE,
OR CASTING TOO
HEAVY

Large Cast'gs
and Machines to
50 Tons.—Turbine
and Building Castings

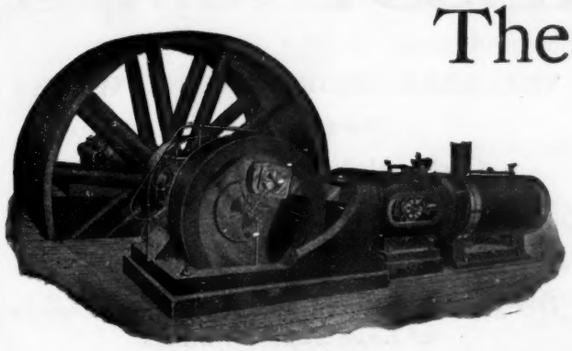
OFFICE AND
WORKS
Buffalo, N. Y.

LAKE ERIE BOILER WORKS
THE BEST EQUIPPED PLANT IN
AMERICA FOR THE MANUFACTURE
OF MODERN MARINE
BOILERS

Large Marine Boilers
to 16 feet in Diameter
Con'l Contracting
& Repair Work

Stand Pipes
Pressure Pipe Line
Blast Furnace Work
Heavy Plate Iron Work

The Buckeye Engine



20 TO 8,000 HORSE-POWER

HAS NO EQUAL FOR

Economy, Regulation, Durability

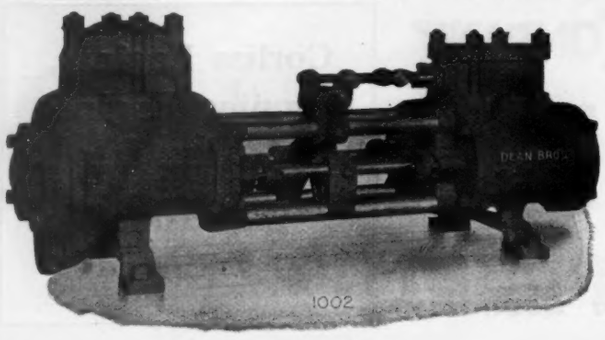
Simple, Tandem, Vertical, Horizontal,
Cross-Compound, Horizontal-Vertical,
Condensing, Non-Condensing,
Low, Medium and High Speeds

Largest line of Modern Engine
Patterns in the United States

BUCKEYE ENGINE CO., Salem, O.

DEAN BROS. STEAM PUMP WORKS

INDIANAPOLIS, IND.



DEAN "DURABLE" DUPLEX PUMPS

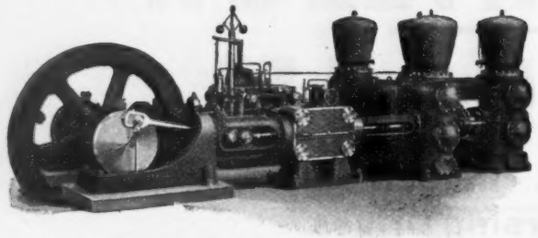
These pumps are a wide departure from the old style of duplex pumps. The steam cylinders are of a new type. The steam ports are arranged on a novel plan. The method of steam cushioning is new, and the valves are of an original form.

THEY WILL NOT SHORT STROKE

We have devised the only duplex pump that will make full stroke, and we have thereby overcome the most serious objections to Duplex pumps.

PRESCOTT HIGH DUTY STATION PUMP

Who builds the Best Mine Pump?
PRESCOTT



for mines where the cost of fuel is high and conditions of head and gallonage warrant first cost.

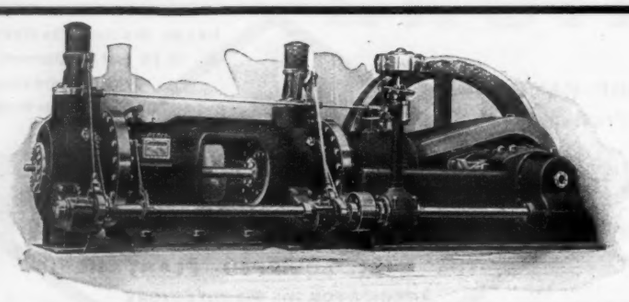
¶ Water End shown handles largest gallonage with fewer parts than any other make of pump.

We also build Direct Acting Pumps for all conditions.
SEND FOR CATALOGUE 20-C.

Fred. M Prescott Steam Pump Co.

MILWAUKEE, WIS.

38



WARREN GAS ENGINES AND SUCTION GAS PRODUCERS

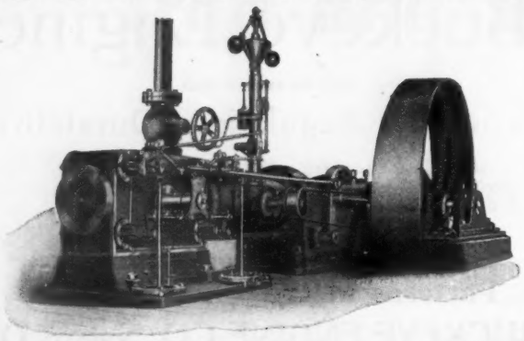
Satisfactory and Continuous Service
Regulation and Economy Guaranteed

Working Parts
Few in Number
Easy of Access

ENGINES OF VERTICAL AND HORIZONTAL TYPES
75,000 Horse Power in Successful Operation

STRUTHERS-WELLS COMPANY
Warren, Penna.

SUPERIOR CORLISS ENGINES



Bulletin No. 40

THE LAKE SHORE ENGINE WORKS

Marquette, Mich.

Corliss Hoisting Engines
Slide Valve Hoisting Engines
Electric Hoists
Cars, Cages, Skips

Designed to meet the exacting requirements of Lake Superior mines.

THE SLOGAN OF THE CAMERON—"CHARACTER THE GRANDEST THING."

Mr. Manager: Have you considered the merits of

Cameron Pumps

to solve your pumping problems?

Regular Pattern
General Service

Highest Efficiency and durability in service, with minimum cost for repairs, are the essential qualifications when selecting the pumps you need. Cameron Pumps have fewer working parts than other steam pumps. The material in them is the best obtainable. All parts are interchangeable, enabling quick replacements in case of accidents.

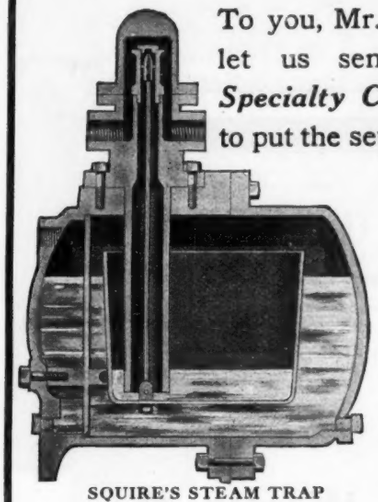
They have other distinctive features, and if you will send for our Catalog "D" you can readily learn why CAMERON PUMPS are superior and preferred in so many places to duplex pumps.

A. S. CAMERON STEAM PUMP WORKS

Foot of East 23d Street NEW YORK

NOTE—We also build Jet, Surface and Barometric Condensers, and desire to bid upon them. 11-26-08

STRONG'S STEAM SPECIALTIES



SQUIRE'S STEAM TRAP

To you, Mr. Steel Mill Man, and other men, let us send you a copy of our *Steam Specialty Catalog "G."* We are willing to put the several cents it costs to mail our 44-page catalog against your postal or letter with the hope of getting your order for some of our specialties. Let us take a chance, neither of us will lose much and both of us may gain a great deal. We are selling thousands of our traps to the steel mills--must be good traps or our business would drop off in that direction--It's growing.

May we send Catalog "G."

THE STRONG, CARLISLE & HAMMOND CO.

336 Frankfort Ave., CLEVELAND, OHIO

520 Arch St.
PHILADELPHIA

261 Centre St.
NEW YORK

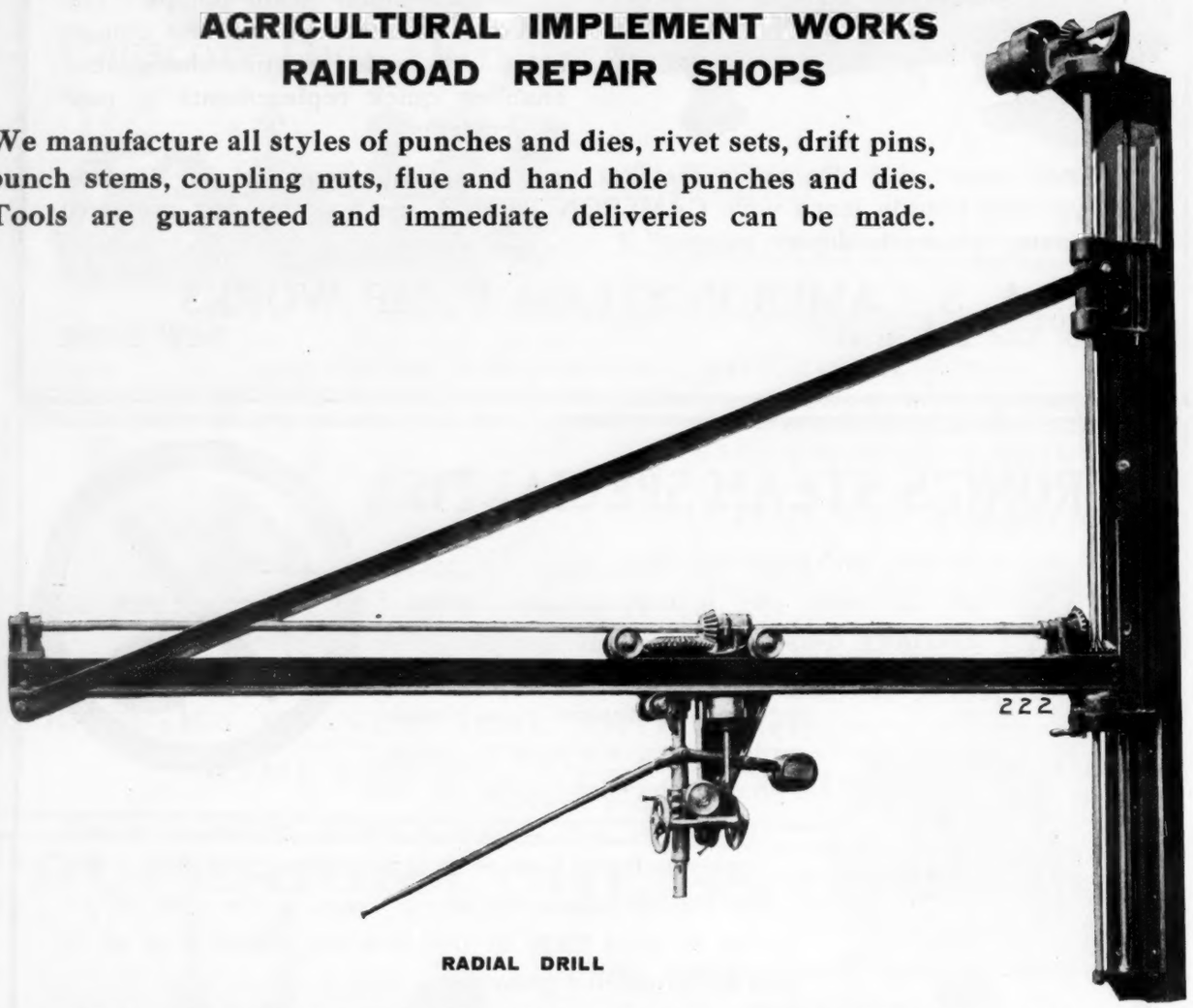
88 Broad St.
BOSTON

Cleveland Tools

are STANDARD for

CAR SHOPS BOILER SHOPS SHIP YARDS
ROLLING MILLS STRUCTURAL SHOPS
AGRICULTURAL IMPLEMENT WORKS
RAILROAD REPAIR SHOPS

We manufacture all styles of punches and dies, rivet sets, drift pins, punch stems, coupling nuts, flue and hand hole punches and dies. Tools are guaranteed and immediate deliveries can be made.



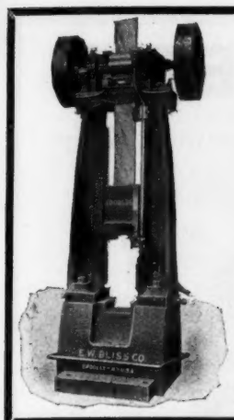
RADIAL DRILL

The Cleveland Punch & Shear Works Co.

1308 E. 40th St.,

CLEVELAND, O.

"Our Name Denotes Quality"



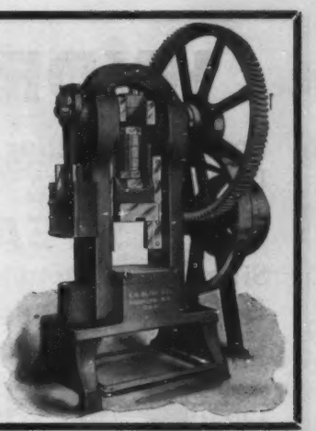
"BLISS"
Drop Forge Machinery

Our Drop Forging Machinery includes **Drop Hammers, Dies, Trimming Presses, Furnaces, Blowers, Etc.** It is built for hard work and long service, its efficiency and quality are unexcelled. We solicit correspondence on the subject and on request will be pleased to send pamphlet describing same.

E. W. BLISS COMPANY

8 Adams Street, BROOKLYN, N. Y.

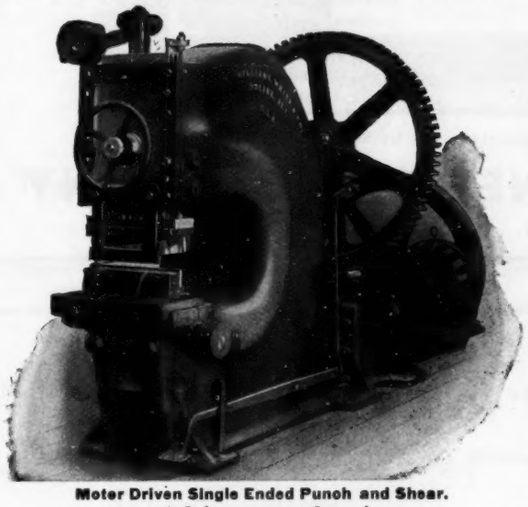
European Office: 100 Boulevard Victor-Hugo, St. Ouen (Paris), France.
London Office: 114 Queen Victoria St., London, E. C., England.



MOLINE FORGING TOOLS

Builders of

Heavy Machinery for Forge and Car Shops
Structural Steel and Implement Works



Motor Driven Single Ended Punch and Shear.

Ask for our catalog of

BULLDOZERS

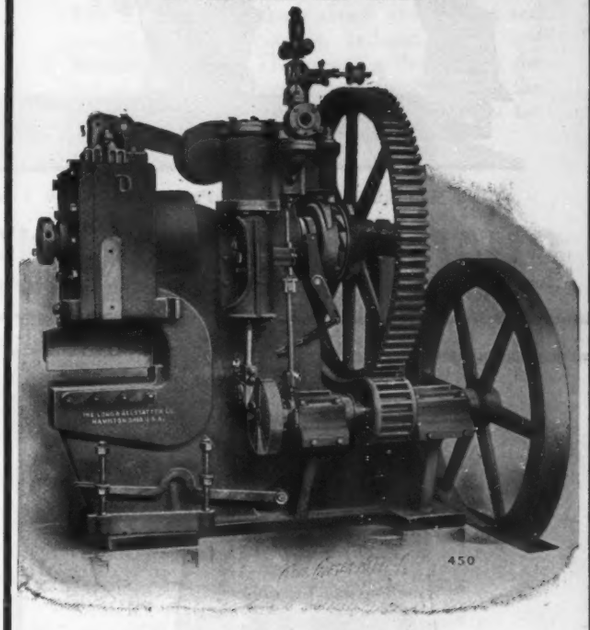
Upsetting and Forging Machines
Beard and Crank Lift Drop Hammers
Justice & Yeakley Vacuum Hammers
Eye Bolt Machines and Forging Rolls

WILLIAMS, WHITE & CO.
Moline, Ill.

2

POWER PUNCHING AND SHEARING MACHINERY

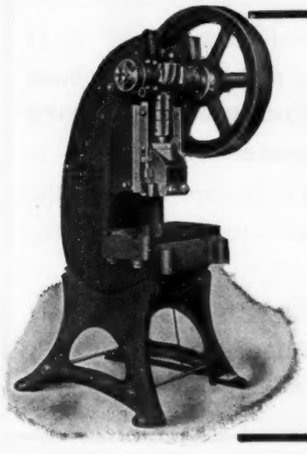
OF ALL SIZES AND KINDS



Heavy Bar Iron Shear

Manufactured by

THE LONG & ALLSTATTER CO.
Hamilton, Ohio



There are no Power Presses better than the

"CONSOLIDATED"

The bearings are self-oiling; the clutch has a positive safety stop; the latch is cushioned; all sizes are fitted with our patented compensating ball joint connection.

Catalogue gives more details. Sent anywhere on request.

CONSOLIDATED PRESS & TOOL CO.
Hastings, Michigan

HYDRAULIC MACHINERY

Forging, Flanging, Forcing and Wheel Presses. Patented Outside Hemp Packed Riveters, Cranes, Pumps and Accumulators.

STEAM HAMMERS

Single and Double Frame, both Guided Ram and Guided Rod Types.

Hydraulic Car Wheel Press, 100 to 600 Tons Capacity. Up to 96″ Between Tie Bars.

CHAMBERSBURG ENGINEERING COMPANY

Chambersburg, Pa., U. S. A.

All sizes.—Send for bulletins numbers 804, 807 and 907.

Buffalo
Foundry & Machine Co.,
BUFFALO, N. Y.

THE TAYLOR-NEWBOLD SAW
PATENTED
INSERTED TEETH IN THIS SAW TREATED UNDER EXCLUSIVE LICENSE OF THE TAYLOR-WHITE PROCESS.
MFD. & SOLD EXCLUSIVELY BY
THE TABOR MFG. CO.
PHILA. U.S.A.

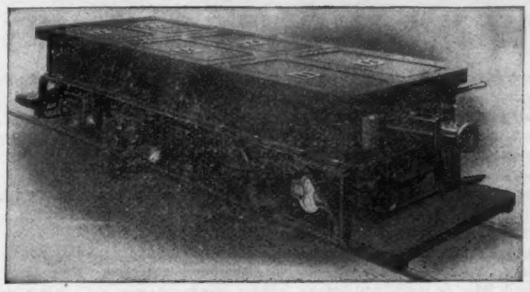
THE TAYLOR-NEWBOLD SAW

Cuts easily a .35 carbon forging 9″ x 14″ in 17 minutes. Actual test on motor driven machines shows **three times the amount of work with the same power** as required on tempered blades. A set of Cutters hardly dulled in Two Weeks continuous cutting .35 carbon steel forgings night and day.

THE TABOR MFG. CO.

18th and Hamilton Sts.,

PHILADELPHIA, Pa.

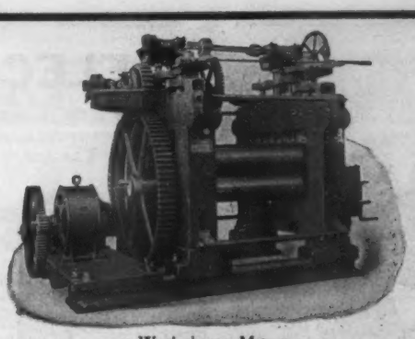


Westinghouse Storage Battery Auto-Trucks

Will pay for themselves within a year,
Can be used as a truck or a locomotive.
They are always ready day or night.
Maintenance charges exceedingly low.
No trolley wires or expensive auxiliaries.
Can be charged without attendance while idle.
Can be operated by any intelligent laborer.

Ask for catalog 257 K

The Westinghouse Machine Co.
Storage Battery Dept.
East Pittsburg, Pa.



Westinghouse Motors
Driving United Engineering Plate Straightening Rolls

A Westinghouse Motor direct connected to a machine has many advantages.

The advantages are both direct and indirect and result in greater economy, reduced labor and increased output. This means a decrease in the cost of the product per unit of output, and at the same time an increase in the revenues from the investment in costly machines and tools.

Ask nearest office for information

Westinghouse Electric & Mfg. Co.
Sales offices in all large cities. PITTSBURG, PA.

THE COES "Key Model" WRENCH

is the finest engine room tool ever made, anywhere, by anybody, at any time.

Made of heavy steel forgings, fully hardened by a special process, used by Mr. Coes for many years.

It will not batter or jam a large nut as will a chain wrench. It will not slip or make trouble and will take anything within its opening capacity, either square or hexagon.

Every Coes Wrench package bears this trade mark:

91

See that you get the genuine.

YOUR DEALER HAS THE "COES."

COES WRENCH CO.
Worcester, Mass.

LANE STEAM HAMMERS

All types and sizes.

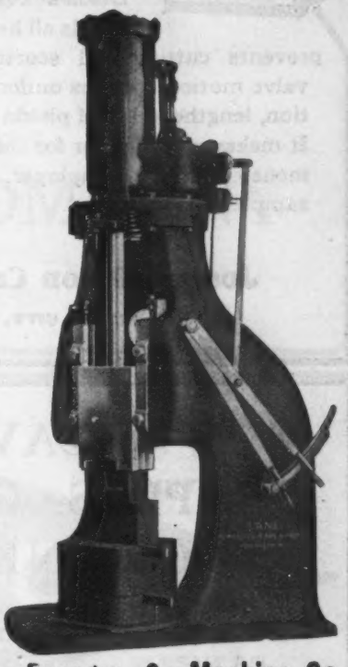
Single Frame—
350 to 2500 lbs.

Steam Drop—
600 to 2500 lbs.

Steam Gravity Drop—
600 to 2500 lbs.

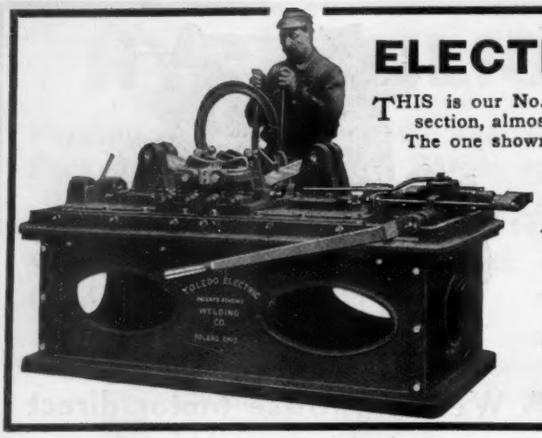
Also special hammers for forming steel wheelbarrow trays, drag scrapers, etc., etc.

Send for new catalogue.



The Massillon Foundry & Machine Co.
MASSILLON, O.

GENERAL AGENTS:
The W. M. Pattison Supply Co., Cleveland, O.
The O. L. Packard Machy. Co., Chicago, Ill.
The E. A. Kinsey Co., Cincinnati, O.
Baird Machinery Co., Pittsburg, Pa.
Hill, Clarke & Co., Inc., Boston, New York and Philadelphia.



ELECTRIC WELDING MACHINES

THIS is our No. 10 Welder—for welding iron and steel up to 1½″ square cross section, almost any shape.

The one shown has a heavy steel ring in the clamping jaws.

It's a two man job. A helper inserts the stock and the man doing the welding pumps the lever shown in front which operates a 5-ton hydraulic jack to force the pieces together.

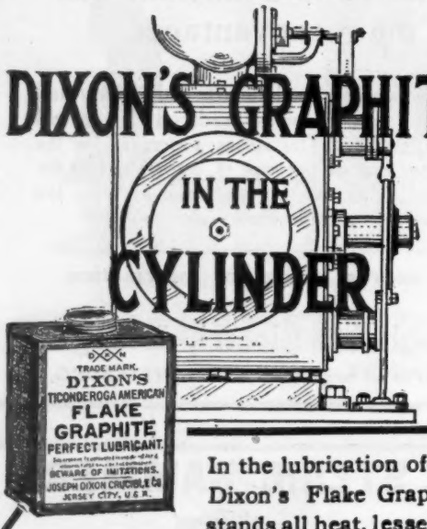
A weld is made in 40 seconds and the work is absolutely accurate and uniform.

It's a time saver—therefore a money saver.

We make other kinds and styles of welders to weld anything that's weldable, from hair pins to propeller shafts.

We would like to tell you more about them if you will give us your address.

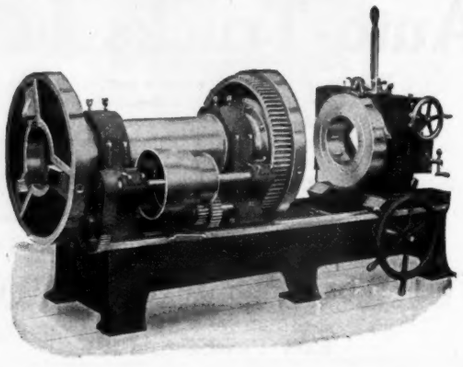
THE TOLEDO ELECTRIC WELDING CO.
873 Spitzer Building TOLEDO, OHIO



In the lubrication of cylinders, Dixon's Flake Graphite withstands all heat, lessens friction, prevents cutting and scoring, makes smooth valve motion, assures uniform steam distribution, lengthens life of piston packing.

It makes work lighter for the engineer; it saves money for the employer. Write for free sample **No. 64.**

Joseph Dixon Crucible Co.
JERSEY CITY, N. J.



DUPLEX MACHINES

Are made for the most enduring service.

They will thread steel pipe with the greatest ease.

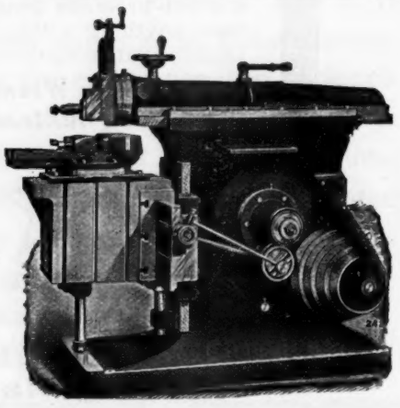
Get the catalog.

BIGNALL & KEELER MFG. CO.
EDWARDSVILLE, ILL.

HEAVY DUTY SHAPERS—GEAR CUTTERS CRANK PLANERS

New 72-page Catalogue, sent on request.

THE CINCINNATI SHAPER CO.
Cincinnati, Ohio, U. S. A.



Bolts, Nuts, Rivets, Washers &c.

RUSSELL BURDSALL & WARD BOLT & NUT CO.

PORT CHESTER, NEW YORK

BRANCH AT ROCK FALLS, ILL.

WESTERN OFFICE, COMMERCIAL NAT'L BANK BLDG., CHICAGO, ILL.

CASE HARDENED, SEMI-FINISHED AND CASTELLATED NUTS A SPECIALTY

YOU CAN'T

Make good Nuts out of poor raw material any more than you can make a silk purse out of a pig's ear.

We knew that when we started making Nuts. Probably no other factor has contributed so much to the reputation of our product for High Quality, Finish, Accuracy and Efficiency.

Send for Prices and Samples.

THE MILTON MFG. COMPANY

MILTON, PENNSYLVANIA.

2

THE UPSON NUT CO. CLEVELAND, O.

QUALITY UNEQUALED PRICES SATISFACTORY

VULCAN IRON IS THE BEST.

HEXAGON
(⅜ to 3 in.)
IRON AND STEEL

LOCKHART IRON & STEEL CO.
PITTSBURGH, PA.
VULCAN

ANGLES
SQUARE ROOT AND FILLET
IRON AND STEEL

IF YOU HAVE HAD TROUBLE WITH THE QUALITY OF IRON YOU HAVE BEEN BUYING TRY OUR VULCAN BRAND. OUR VULCAN XX STAYBOLT IRON IS MADE FROM CHARCOAL PIG, AND IS THE BEST IN THE MARKET. ALL SIZES MERCHANT BARS.

Norton Grinding Wheels
Made of Alundum

NORTON

Reason for Alundum

It is used as the basis of Norton Grinding Wheels because we believe it to be unequalled as an abrasive for manufacturing grinding wheels. And the many years of "Norton Experience" is not a matter to be overlooked.

It has the proper temper, and the right kind of fracture for rapid, economical cutting. Uniformity is a prime factor.

Give us full details of the conditions and let us help you to select that one wheel that will do your work better than any other.

New York
Chicago
Niagara Falls

Norton Company
Grinding Wheel Works
Worcester, Mass.

F 50

CARBORUNDUM
NIAGARA FALLS

Hardness

is an important characteristic of a grinding wheel—
It means long life—
But—
hardness without sharpness is useless

CARBORUNDUM

is harder than any other abrasive material—
It is also sharper—
Very much sharper—
That is why a Carborundum Grinding Wheel not only lasts much longer than any other wheel—
but does much more work every day while it is lasting.

Ask us for the Carborundum Book

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.

COMPLETE
OR PART
EQUIPMENT

1856 THE TURNER VAUGHN AND TAYLOR CO. 1908

CUYAHOGA FALLS
OHIO, U. S. A.

MACHINERY

For
WIRE DRAWING
WIRE NAIL
WELDED CHAIN
VITRIFIED SEWER-PIPE

Write for Information and Prices. "Do It Now."

Mention The Iron Trade Review when writing

Everything You Need In Your Foundry

Is the Best Any Too Good for Your Work?

When castings are wanted particularly smooth, bright, and of a uniform color, it is necessary to return the facing.

NATIONAL RETURN FACING

will not stick to the pattern and will aid the first or heavy facing. It will assist in peeling the casting and give it the proper color. National Return Facing, as are all our facings, is guaranteed.

Samples gladly furnished

WE MANUFACTURE FACINGS for EVERY CLASS of WORK

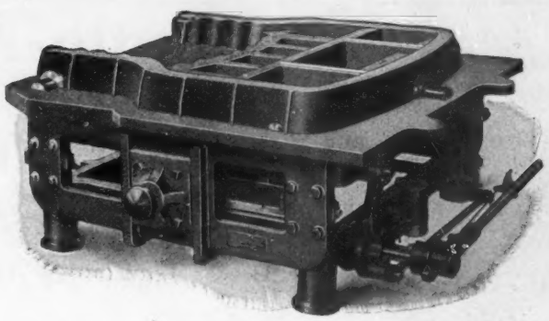
The S. Obermayer Co.

CINCINNATI CHICAGO PITTSBURGH

Canadian Agents: The Dominion Foundry Supply Co., Toronto and Montreal. 18

We Have Been Manufacturing Since 1874

Pridmore Stripping Plate and Rock-over Drop Molding Machines



52″x 52″ Stripping Plate Machine Fitted with Boiler Section Pattern

Cost of Molding, by Hand $2.00; by Machine 75c.

Manufactured by

Henry E. Pridmore

19th and Rockwell Sts.,

Chicago, Illinois

Saves Three Ways

LABOR TIME and MONEY

Frederic B. Stevens

Manufacturer

FOUNDRY FACINGS

Detroit, Mich.

Clannish or Canny?

Some time ago we placed a Steam-Hydraulic Elevator in one of the great paper making sections of our land.

Since then we have been kept busy supplying the other paper mills in that section.

As fast as a mill gets up against an elevator proposition the Steam-Hydraulic goes in.

The whole paper making world is coming out from under the Elevator Curse as fast as we can make Steam-Hydraulic Elevators.

The only reason you do not have Steam-Hydraulics in your plant is because you have not yet discovered this wonderful machine.

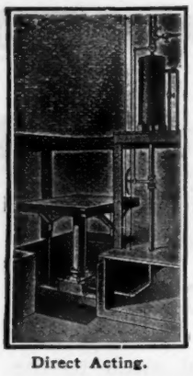
Let us refer you to the establishments near you, where you can see for yourself.

We give you a perfect Hydraulic Elevator that goes without cost, has no repairs, and which you don't pay one cent for until it is set up in your works and makes good.

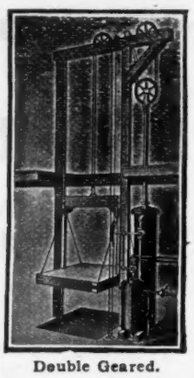
If you are half smart, when you need an elevator you will

Hook 'er to the Biler.

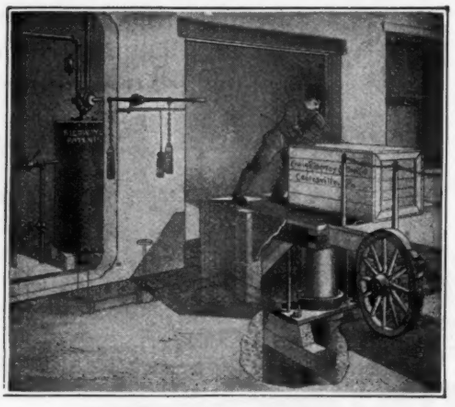
CRAIG RIDGWAY & SON,
Coatesville, Pa.



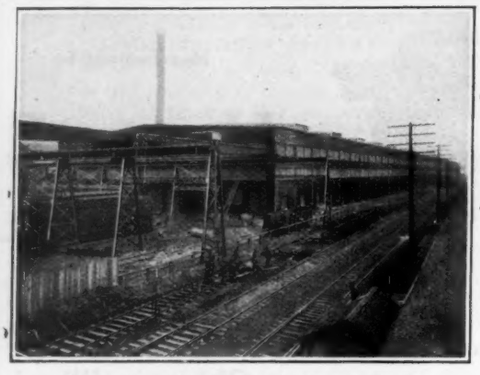
Direct Acting.



Double Geared.



The Greatest of Money Makers.



Shops—Amer. Car & Foundry Co., St. Louis

McClintic-Marshall
Construction Company
STEEL BUILDINGS, BRIDGES, Etc.

Annual Capacity 150,000 Tons.

WORKS { PITTSBURG, PA / POTTSTOWN, PA. / CARNEGIE, PA.

Contracting Offices { Pittsburg, Pa., Park Bldg. / New York, 21 Park Row. / Chicago, First Nat. Bank Bldg / St. Louis, Third Nat'l Bank Bldg. / Pottstown, Pa.

METALLURGY OF CAST IRON

By Thos. D. West.

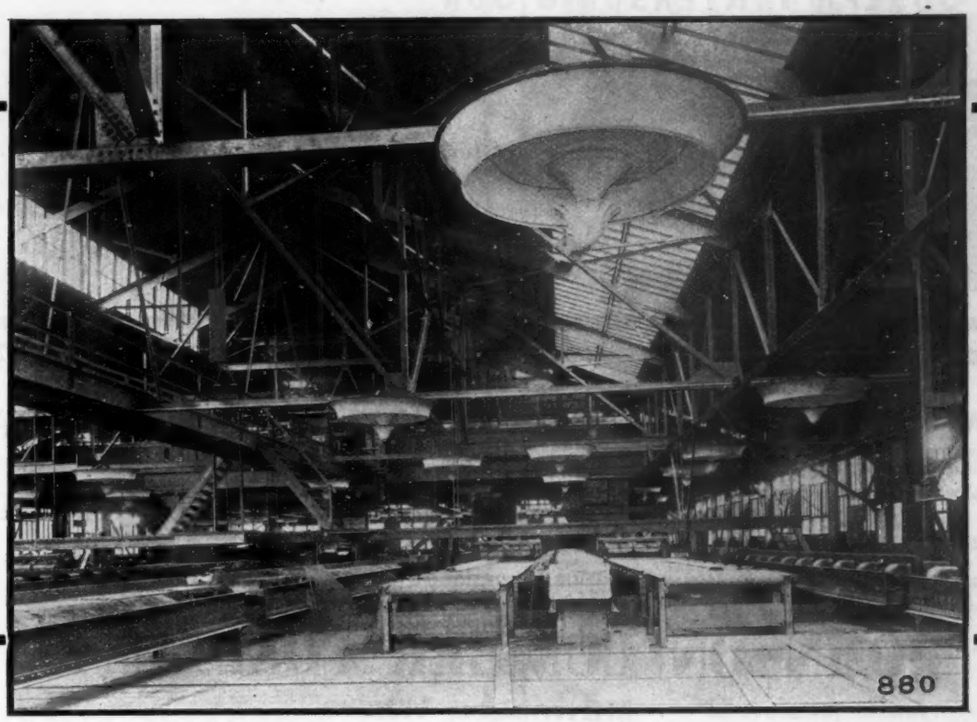
628 pages. ***153 illustrations.*** ***Price $3.00.***

THE author begins with a chapter relating to the manufacture of coke and carries the reader through the operations involved in blast furnace practice, showing how iron is affected by changes during its manufacture. Advice is given for purchasing and sampling iron. The elements in cast iron and their physical effects are dwelt upon, typical mixtures being shown for all classes of castings. Methods for calculating mixtures according to their chemical contents are given and the general utility of chemical analyses explained. The latter part of the book is given over to the testing of cast iron, records being appended of a number of investigations with which Mr. West has been connected. About 50 pages are devoted to selected tables of general utility to the founder.

Book Department
THE PENTON PUBLISHING COMPANY, CLEVELAND, O.

American Bridge Company of New York

Structural Steel for Every Purpose



Interior of Planing Mill, Great Southern Lumber Company, Bogalusa, La.

Annual Capacity 750,000 Tons

Contracting Offices in 24 American Cities

General Offices:
Hudson Terminal, 30 Church St., New York

WROUGHT MERCHANT PIPE

Part of Shipping Floor—Pipe Mill

Black and Galvanized. ⅛ inch to 12 inches.
Casing, Tubing and Drive Pipe. Oil and Gas Line Pipe.

Basic Pig Iron, Open Hearth Steel Slabs,
Sheet Bars, Universal Plates, Wide Flats, Sheared
Plates, Skelp, Groove-rolled Plates, Tack and Shovel Plate, Cut Nails,
Black and Galvanized Open Hearth Sheets.

LA BELLE IRON WORKS

Steubenville, Ohio.

ESTABLISHED IN 1852.

ESTABLISHED 1842 INCORPORATED 1888

JOSEPH T. RYERSON & SON

The largest iron and steel— warehouses in the world

EDWARD L. RYERSON, PRESIDENT CLYDE M. CARR, VICE-PRESIDENT

GENERAL OFFICES AND WAREHOUSES, CHICAGO

Sent regularly —free —if you wish it.

Structural shapes, plates, sheets, bars, bands, rivets, boiler tubes also a full line of fittings, specialties and machinery for railroad, boiler and structural shops, sheet metal workers, mines, etc.

ALL SIZES IMMEDIATE SHIPMENT

Now is the time to put in a stock of Pattern Lumber

We have several large assorted stocks of Genuine Soft Cork Pine Pattern Lumber in Michigan and Wisconsin on which we will be pleased to name delivered prices in carload lots. Shipments made direct from the mills. We carry an assortment of stock running from ½" to 4" in thickness.

We can also supply Flask, Boxing, Crating, Templet Stock, etc., in mixed cars with the Pattern Stock, covering all your requirements in Pine Lumber. Write for delivered prices.

JOHNSON LUMBER COMPANY

Milwaukee, Wis.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Youngstown, Ohio

Galvanized and Painted Roofing

Corrugated, V Crimped, Roll and Standing Seam

Our Specialty: Old-Fashioned Double Refined Puddled Iron Roofing

COCHRANE

Feed Water Heaters
Steam & Oil Separators

WATER PURIFICATION SEND FOR PARTICULARS HARRISON SAFETY BOILER WORKS CLEARFIELD & 17TH STS., PHILADELPHIA, PA.

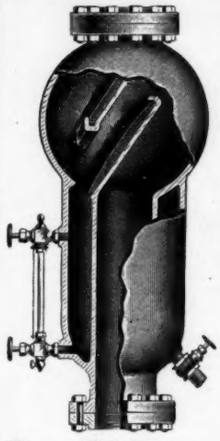


Figure "M", Vertical
We make many different types.—Send for Catalog

With every stroke of the piston you save money **if** this Separator gets a chance at the steam before it gets to the cylinder.

Because

Austin Steam Separators

Make Wet Steam DRY and DRY STEAM is many times more efficient and safe than Wet Steam.

DRY STEAM is steam with the heat units intact.—It requires less fuel than Wet Steam in that it retains its heat. DRY STEAM CANNOT WASH OUT THE CYLINDER OIL BEFORE IT HAS OPPORTUNITY TO COMPLETE ITS WORK: Wet Steam will.—DRY STEAM IS A GUARANTEE AGAINST CYLINDER EXPLOSIONS—Wet steam makes cylinder explosions quite possible.

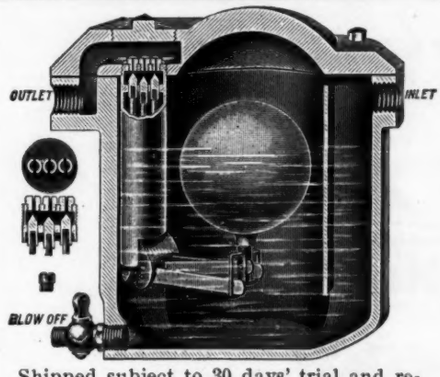
We ship on trial—We run all risk

AUSTIN SEPARATOR CO.
DETROIT, MICH. **44 Woodbridge St.**

MALLEABLE IRON CASTINGS

Light and Medium Weight
from
Customers' Patterns

The Chisholm & Moore Mfg. Co.
Cleveland, Ohio.



Shipped subject to 30 days' trial and return at our expense if unsatisfactory.

Three Valves in this Trap provide practically Three Traps in One—one Valve for normal flows—two for flood, and all three for full capacity of Inlet Pipe.

The Wright "Emergency"

Continuous Flow, High Pressure

STEAM TRAP

keeps the steam lines and connections automatically drained of accumulating condensation regardless of small flows or floods, and without steam waste in the operation.

WRIGHT MANUFACTURING CO.
DETROIT, MICH. **36 Woodbridge St.**

ADVERTISERS

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month.

†Abrasive Material Co..... —
†Acme Machinery Co..... —
Acme Steel & Malleable Iron Works..... 85
†Albion Malleable Iron Co..... —
*Allen, John F..... —
Alliance Machine Co..... 99
American Air Compressor Works..... 91
American Bridge Co..... 33
American Fork & Hoe Co..... 102
American Iron & Steel Mfg. Co..... 16
American Refractories Co..... 113
American Sheet & Tin Plate Co.....9, 11
American Specialty Co..... 95
American Steel & Wire Co..... 4
American Watchman's Time Detector Co.. —
Anderson Forge & Machine Co..... 89
Armstrong Bros. Tool Co..... 117
Ashland Fire Brick Co..... 113
Atlas Car & Mfg. Co..... 119
†Auburn Ball Bearing Co..... —
Austin Separator Co..... 77
Avery Stamping Co..... 102

†Baird Machinery Co..... —
*Baird & West ..... —
†Baker Bros. ..... —
Ball Engine Co..... 103
Bardons & Oliver..... 120
Barnett, G. & H., Co..... 95
Bartlett, C. O., & Snow Co..... 99
Bassett-Presley Co. 1
Beals & Co..... 81
†Beaudry & Co..... —
Bellefontaine Bridge & Steel Co..... 106
*Bertsch & Co..... —
Bessemer Coke Co..... 109
Bethlehem Steel Co..... 119
†Bickford Drill & Tool Co..... —
Bickford Fire Brick Co..... 113
Bignall & Keeler Mfg. Co..... 28
Bilgram, Hugo 97
Birdsboro Steel Fdy. & Machine Co..... 81
†Birmingham Iron Foundry..... —
Blackwell, Geo. G., Sons & Co..... 108
Blair, Reed F., & Co..... 109
Bliss, E. W., Co..... 25
Bond, Vivian, & Co..... 108
Bourne-Fuller Co 120
†Bowes, Homer ..... —
*Braddock Machine & Mfg. Co..... —
†Bradley, C. C., & Son..... —
†Bristol Co. ..... —
Brown, Edward, & Son..... 91
Brown Hoisting Machinery Co..... 107
Buckeye Engine Co..... 21
Bucyrus Co. 102
Bucyrus Steel Casting Co..... 83
Buffalo Foundry & Machine Co.....26, 79
Buffalo Steel Co.....7, 9
†Bury Compressor Co..... —

Caldwell, H. W., & Son Co..... 97
Cameron, A. S., Steam Pump Works... 23
Canton Brass Co..... 91
Carborundum Co. 30
Carnegie Steel Co..... 6
Celfor Tool Co..... 95
Central Track Supply Co..... 115
Chambersburg Engineering Co..... 26
†Champion Engineering Co..... —
Champion Rivet Co..... 95
*Chaplin-Fulton Mfg. Co..... —
Chase Foundry & Mfg. Co..... 102
Chicago Drop Forge & Foundry Co..... 2
Chicago House Wrecking Co..... 117
*Chicago Rawhide Mfg. Co..... —
†Chicago Screw Co..... —
Chicago Steel Foundry Co..... 83
Chisholm & Moore Mfg. Co..... 77
*Cincinnati Electrical Tool Co..... —
Cincinnati Iron & Steel Co..... 2
Cincinnati Machine Tool Co..... 95
†Cincinnati Milling Machine Co..... —
Cincinnati Shaper Co..... 28
†Clapp, E. D., Mfg. Co..... —
Clearfield Fire Brick Co..... 112
†Cleveland Belting & Machinery Co..... —
Cleveland Castings Pattern Co..... 91
Cleveland City Forge & Iron Co..... 2
*Cleveland Crane & Engineering Co..... —
*Cleveland Galvanizing Works Co..... —
*Cleveland Pneumatic Tool Co..... —
Cleveland Punch & Shear Works Co.... 24
*Cleveland Steel Stamp Works..... —
Clinton Iron & Steel Co..... 112
Coes Wrench Co..... 27
Cole, J. Wendell ..... —
†Columbus Equipment Co..... —
Columbus Forge & Iron Co..... 89
Columbus Iron & Steel Co..... 112
*Consolidated Mfg. Co..... —
Consolidated Press & Tool Co..... 25
Cooper, C. & G., Co..... 18
Corrigan, McKinney & Co..... 108
Curtis & Co. Mfg. Co..... 99

†Dake Engine Co..... —
†Davis, W. P., Machine Co..... —
Dayton Malleable Iron Co..... 85
Dean Bros. Steam Pump Works..... 22
*Debevoise-Anderson Co. ..... —
DeCamp Bros. & Yule Iron, Coal & Coke Co. 112
Deming Co. 3
Detroit Hoist & Machine Co..... 101
Dixon, Joseph, Crucible Co..... 28
Dodge Mfg. Co..... 101
Dover Fire Brick Co..... 113
Dravo, Doyle & Co..... 103
Duff Patents Co..... 91
Dyson, Joseph, & Sons..... —

Eaton, Rhodes & Co..... 112
†Economy Drawing Table Co..... —
Edwards Mfg. Co..... 15
Electric Controller & Mfg. Co..... 120
Emmerton, F. A..... 108
Empire Iron & Steel Co..... 15
Erie Forge Co..... 89
Erie Malleable Iron Co..... 87
†Espen-Lucas Machine Works..... —
Eynon-Evans Mfg. Co..... 107

Fairview Fluor-Spar & Lead Co..... 112
†Farrel Foundry & Machine Co..... —
†Ferracute Machine Co..... —
†Firth-Sterling Co. ..... —
†Flagg, Stanley G., & Co..... —
Flory, S., Mfg. Co..... 102
*Foote Bros. Gear & Machine Co..... —
Fox Machine Co..... 95
†Freeman Pattern Works..... —

*Galesburg Malleable Castings Co..... —
†Ganschow Co., Wm..... —
Garrett-Cromwell Engineering Co..... 107
General Drop Forge Co..... 89
General Electric Co..... —
Globe Rolling Mill Co..... 13
Goodyear, S. W..... 87
*Graham Nut Co..... —
Grand Rapids Malleable Works..... 87
Grasselli Chemical Co..... 18
Green Engineering Co..... 106
†Green Fuel Economizer Co..... —
G. M. Lathe Co..... 114
†Guerrlich, F. C..... —

*Hammond-Byrd Co..... —
Hanna, M. A., & Co..... 111
Hanna Engineering Works 95
*Harbison-Walker Refractories Co..... —
Harrison Safely Boiler Works..... 77
†Harvey, Arthur C., Co..... —
Hathaway, A. G., & Co..... 117
†Hazleton Sheet Steel Co..... —
Heppenstall Forge & Knife Co..... 91
Hickman, Williams & Co..... 108
Highland Iron & Steel Co..... 7
Hillman, J. H., & Son..... 11
Hogg, Geo. A., Iron & Steel Fdy. Co.... 103
Horsburgh & Scott Co..... 97
†Hubley Mfg. Co..... —
Hunt, Robert W., & Co..... 108

Illinois Central R. R..... 114
Illinois Steel Co., North Works..... 14
Illinois Zinc Co..... 91
Independent Pneumatic Tool Co..... 95
Industrial Works 102
Inland Steel Co.....7, 9
Interstate Engineering Co..... 106
*Interstate Iron & Steel Co..... —

Jamison Coal & Coke Co..... 109
Jeffrey Mfg. Co..... 99
Jenkins Bros. 105
Jessop, Wm. & Sons, Ltd..... 85
Johnson Lumber Co..... 34
†Jones & Lamson Machine Co..... —
Jones & Laughlin Steel Co..... 8

Kennedy, Julian 107
Kennedy, Walter 107
*Kenworthy Engineering Co..... —
Keystone Steel Co..... 17
Knudsen-von Kothen Mfg. Co..... 105
*Kratzer, W. N., & Co..... —

LaBelle Iron Works 15, 34
Lackawanna Steel Co..... 10
Ladd & Baker 107
Lake Erie Engineering Works..... 21
Lake Erie Ore Co..... 108
Lake Shore Engine Works..... 22
†Lakeside Malleable Castings Co..... —
Lamond, D., & Son..... 107
†Landis Tool Co..... —
Laughlin, Alex., & Co..... 106
Lea, J. Tatnall, & Co..... 112
*LeBlond, R. K., Machine Tool Co..... —
†Lingle, J. H..... —
Lockhart Iron & Steel Co..... 30
*Lodge & Shipley Machine Tool Co..... —
Long & Allstatter Co..... 25

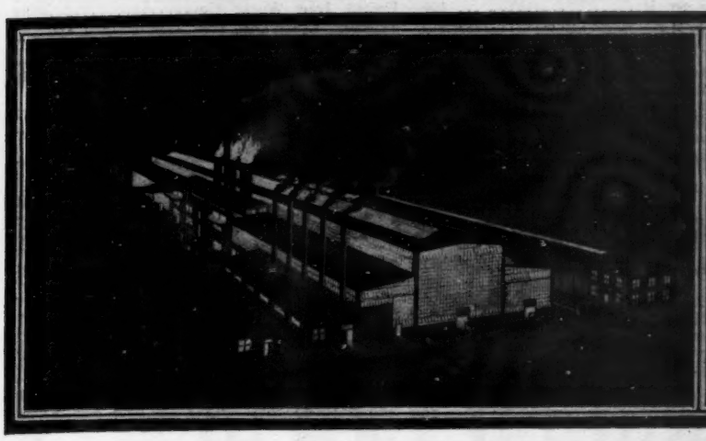
Macbeth Iron Co..... 81
Machinery Forging Co..... 89
Mackintosh, Hemphill & Co..... 20
*Marchant, Geo. F..... —
Marion Steam Shovel Co..... 120
Marshall Foundry Co..... 79
†Massachusetts Steel Casting Co..... —
Massillon Foundry & Machine Co..... 27
†McCabe, J. J..... —
McClintic-Marshall Construction Co.. .. 32
McClure, G. W., Son & Co..... 106
McGowan Co., J. H..... 117
McKee, Arthur G..... 107
McKeefrey & Co..... 109
McLanahan-Stone Machine Co..... 99
McMyler Mfg. Co..... 102
Meadville Malleable Iron Co..... 87
Meehan Boiler & Construction Co..... 17
†Merrill Bros. ..... —
Mesta Machine Co..... 19
Michigan Machinery Mfg. Co..... 95
Milton Mfg. Co..... 29
†Missouri Malleable Iron Co..... —
Mitchell-Diggins Iron Co..... 112
Morgan Construction Co..... 106
Morgan Engineering Co..... 101
Motch & Merryweather Machinery Co.... 115
Mudge, Edmund W., & Co..... 13

National Bolt & Nut Co..... 95
National Foundry Co..... 81
†National Machinery Co..... —
National Tube Co.....99, 114
*Negley Clay Co..... —
Newark Gear Cutting Machine Co..... 97
†Newbold, R. S., & Son Co..... —
†New Britain Machine Co..... —
*New Jersey Foundry & Machine Co.... —
*New Process Rawhide Co ..... —
Niagara Device Co..... 16
Nicholson File Co..... 93
Nicoll, B., & Co..... 117
†Niles-Bement-Pond Co. ..... —
Niles Iron & Steel Co..... 15
North Works, Illinois Steel Co..... 14
Northern Engineering Works..... 101
†Northern Malleable Iron Co..... —
†Northwestern Malleable Iron Co..... —
Norton Co. 30
Norwalk Iron Works Co..... 91

Oak Hill Fire Brick & Coal Co..... 113
Obermayer, S., Co..... 31
Oglebay, Norton & Co..... 108
*Ohio Boiler Co..... —
Ohio Fire Brick Co..... 113
*Ohio Forge Co..... —
Ohio Malleable Iron Co..... 87
Otis Steel Co..... 83

Palmer-Bee Co. ..... —
Parkesburg Iron Co..... 81
Pawling & Harnischfeger 101
Paxson Co., J. W..... 117
*Peck, Francis J., & Co..... —
Petroleum Iron Works Co..... 17

GRAY IRON CASTINGS



CASTINGS

Gray Iron, Semi-Steel, Air Furnace, any size, up to 200 tons in weight.

Chemical and Caustic Castings a Specialty.

Have well equipped chemical and physical testing laboratory.

Over 200 ton traveling crane capacity operated by Niagara Falls Power.

BUFFALO FOUNDRY & MACHINE CO.

BUFFALO, N. Y.

The Marshall Foundry Co.

Twenty-Eighth and Railroad Sts.,

PITTSBURGH, PA.

Manufacturers of

Ingot Molds and Iron Castings

OF ALL DESCRIPTIONS

Capacity

250 TONS PER DAY

FINE GREY IRON CASTINGS

of every description,

Including Stove Plate, Machinery, Rammed and Rapped by Compressed Air, Sand Blasted, Japanned, Nickel, Brass and Copper Plated. Also Builders' Hardware.

THE TAYLOR & BOGGIS FOUNDRY CO.

Cleveland, O.

THE SHELBY FOUNDRY CO.

SHELBY, OHIO

Light and Heavy Grey Iron Castings

Capacity 25 Tons Daily

CAN GIVE PROMPT DELIVERY

GRAY IRON MACHINERY CASTINGS

Walker Foundry Company

ERIE, PA.

Philadelphia Gear Works..... 97
*Phoenix Iron Works Co..... —
Phosphor-Bronze Smelting Co..... 81
Pickands, Brown & Co..... 108
Pickands, Mather & Co..... 108
Pilling Air Engine Co..... 101
Pittsburg Construction Co..... 106
Pittsburg Piping & Equipment Co..... 105
Pittsburg Shafting Co. of Detroit..... 93
Pittsburg Steel Co..... 17
Pittsburg Steel Construction Co..... 93
Pittsburg Valve Fdy. & Construction Co. 105
Port Huron Engine & Thresher Co.....87
Powell Co., Wm..... 105
Pratt & Letchworth Co..... 87
Prescott, Fred M., Steam Pump Co..... 22
Pridmore, Henry E..... 31
Prime Steel Co..... 83

Randle Machinery Co..... 117
Rempe Co. 103
Republic Iron & Steel Co..... 12
Reserve Machinery Co..... —
*Richardson & Co..... —
Ridgway, Craig, & Son..... 32
Riter-Conley Mfg. Co..... 119
†Riverside Steel Casting Co..... —
Rogers, Brown & Co..... 110
*Ross-Meehan Foundry Co..... —
†Ruddiman, John ..... —
Russell, Burdsell & Ward Bolt & Nut Co. 29
Ryerson, Joseph T., & Son 34

Scaife, Wm. B., & Sons Co.....93, 105
†Schumacher & Boye ..... —
Scioto Fire Brick Co..... 113
Scully Steel & Iron Co..... 7
Seaman, Sleeth Co..... 103
Seaver, John W..... 106
Seneca Iron & Steel Co..... 9
*Shanklin, Jas. R., Co..... —
Sharon Foundry Co..... 85
Shelby Foundry Co..... 79
†Shelby Steel Tube Co. (see National Tube Co.) ..... —
Shenango Furnace Co..... 111
Shepard Electric Crane & Hoist Co..... 99
Smith, J. D., Foundry Supply Co..... 3
Smythe Co., S. R..... 106
Soisson, Jos., Fire Brick Co..... 113
†Solid Steel Casting Co..... —
Southwark Foundry & Machine Co..... 103
†Standard Boiler & Plate Iron Co..... —
†Standard Engineering Co..... —
Standard Gauge Steel Co..... 85
†Standard Malleable Iron Co..... —
Standard Pattern Works..... 91
Steel Car Forge Co..... 89
Stevens, F. B..... 31
†Stewart, John A., Electric Co..... —
Stewart Iron Co..... 109
*Stoever Foundry & Mfg. Co..... —
Stow Mfg. Co..... 119
Stowe-Fuller Co. 113
Strong, Carlisle & Hammond Co..... 23
Strong Steel Foundry Co..... 85
Struthers-Wells Co. 22
Stupakoff, S. H..... 91
Superior Charcoal Iron Co..... 109
†Swank's Sons, Hiram ..... —
Swindell, Wm., & Bros..... 106

Tabor Mfg. Co..... 26
Taylor & Boggis Foundry Co..... 79
†Taylor Co., N. & G..... —
†Taylor-Wilson Mfg. Co..... —
Tennessee Coal, Iron & Railroad Co.. .. 111
Thew Automatic Shovel Co..... 102
Thomas Furnace Co..... 112
Thomson Electric Welding Co..... 93
Thomson, W. H., & Co..... 87
Tod-Stambaugh Co..... 108
Tod, Wm., Co..... 18
Toledo Electric Welding Co..... 28
Toledo Machine & Tool Co..... 3
*Toomey, Frank ..... —
Transue & Williams Co..... 91
Turner, Vaughn & Taylor Co..... 30

Uehling Instrument Co..... 91
*Union Fdy. & Machine Co..... —
†Union Malleable Iron Co..... —
United Engineering & Foundry Co..... 5
United Iron Works Co..... 89
†United States Cast Iron Pipe & Fdy. Co. —
United Steel Co..... 85
†Universal Portland Cement Co..... —
Upson Nut Co..... 29

Van Dorn & Dutton Co..... 97
†Vandyck Churchill Co..... —

Walker Foundry Co..... 79
Walter-Wallingford & Co..... 109
Ward, William, Machinery Co..... 115
†Warner & Swasey Co..... —
Washington Coal & Coke Co..... 118
*Waterbury Farrel Fdy. & Machine Co.. —
*Watson, N. A..... —
*Watson-Stillman Co. ..... —
†Waukesha Malleable Iron Co..... —
†Webner, F. E..... —
Wellman-Seaver-Morgan Co. 106
Westinghouse Electric & Mfg. Co..... 27
Westinghouse Machine Co..... 27
*West Virginia Malleable Iron Co..... —
Wheeling Mold & Foundry Co..... 21
Whiting Foundry Equipment Co..... 99
Wickes Bros. 115
*Wiener Co., Ernst..... —
*Wilfong Bros. ..... —
†Williams Tool Co..... —
Williams, White & Co..... 25
Wisconsin Engine Co..... 21
†Wisconsin Malleable Iron Co..... —
Wister, L. & R., & Co..... 108
Wood, Alan, Iron & Steel Co..... 93
Wood, R. D., & Co..... 103
Wright Mfg. Co..... 77
Wyman & Gordon Co..... 119

Youngstown Car Mfg. Co..... 2
Youngstown Fdy. & Machine Co..... 16
Youngstown Sheet & Tube Co..... 34

BUYERS' DIRECTORY

Advertisers' names are inserted at the rate of thirty-two classifications for each page advertisement carried regularly.

ABRASIVES.

Abrasive Material Co., Philadelphia, Pa.
Carborundum Co., Niagara Falls, N. Y.
Cole, J. Wendell, Columbus, O.
Norton Company, Worcester, Mass.

ACCESSORIES (Lathe).

Armstrong Bros. Tool Co., Chicago.
New Britain Machine Co., New Britain, Conn.
Warner & Swasey Co., Cleveland, O.

ACCOUNTING (Cost).

Webner, F. E., & Co., Cincinnati, O.

ACCUMULATORS (Hydraulic).

Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Farrel Fdy. & Mch. Co., Ansonia, Conn.
Lake Erie Engineering Works, Buffalo, N. Y.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., Alliance, O.
Mesta Machine Co., Pittsburg, Pa.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Fdy. & Mch. Co., Waterbury, Conn.
Watson-Stillman Co., New York City.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Wood & Co., R. D., Philadelphia, Pa.

ALARMS (High or Low).

Wright Mfg. Co., Detroit, Mich.

ALLOY

Blackwell Sons & Co., Geo. B., Liverpool, Eng.
Phosphor-Bronze Smelting Co., Philadelphia, Pa.

ANGLES, TEES, CHANNELS (Iron and Steel).

American Bridge Co. of New York.
Buffalo Steel Co., Tonawanda, N. Y.
Carnegie Steel Co., Pittsburg, Pa.
Cincinnati Iron Store Co., Cincinnati, O.
Globe Rolling Mill Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
Lockhart Iron & Steel Co., Pittsburg, Pa.
North Works, Chicago, Ill.
Pittsburg Steel Construction Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson & Son, Joseph T., Chicago, Ill.
Scully Iron & Steel Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

ANNEALERS (Wire, Muffle and Pot).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

ANTI-VIBRATORS.

Ruddiman, John, New York, N. Y.

ARMATURES.

General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

ASSAYERS.

Emmerton, F. A., Cleveland, O.
Peck, Francis J., & Co., Cleveland, O.

AXLES.

Carnegie Steel Co., Pittsburg, Pa.
Consolidated Mfg. Co., Toledo, O.
Cleveland City Forge & Iron Co., Cleveland, O.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Otis Steel Co., Ltd., Cleveland, O.

AXLES (Automobile).

Consolidated Mfg. Co., Toledo, O.

BALLS (Steel).

Auburn Ball Bearing Co., Rochester, N. Y.
Transue & Williams Co., Alliance, O.
Wyman & Gordon, Worcester, Mass.

BANDS.

Carnegie Steel Co., Pittsburg, Pa.
Globe Rolling Mill Co., Cincinnati, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Pittsburg Steel Co., Pittsburg, Pa.

BARRELS (Tumbling).

Northern Engineering Works, Detroit, Mich.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Fdy. Equipment Co., Harvey, Ill.

BARROWS.

American Fork & Hoe Co., Cleveland, O.
Meehan Boiler & Cons. Co., Lowellville, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Youngstown Car Mfg. Co., Youngstown, O.

BARS (Concrete Reinforcing).

American Sheet & Tin Plate Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
Beals & Co., Buffalo, N. Y.
Buffalo Steel Co., Tonawanda, N. Y.
Cincinnati Iron Store Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
North Works, Chicago, Ill.
Ryerson, Jos. T., & Son, Chicago, Ill.

BARS (Iron and Steel).

American Bridge Co., New York City.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Beals & Co., Buffalo, N. Y.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Carnegie Steel Co., Pittsburg, Pa.
Cincinnati Iron Store Co., Cincinnati, O.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., Boston, Mass.
Highland Iron & Steel Co., Terre Haute, Ind.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
Lockhart Iron & Steel Co., Pittsburg, Pa.
North Works, Chicago, Ill.
Milton Mfg. Co., Milton, Pa.

GRAY IRON CASTINGS

HEAVY CASTINGS

HEAVY MACHINE WORK

THE MACBETH IRON CO.

CLEVELAND, OHIO

ELEPHANT BRAND

DELTA

REG. U. S. PAT. OFF.

THE PHOSPHOR BRONZE SMELTING CO., Limited.

2200 WASHINGTON AVENUE, PHILADELPHIA, PA.

ELEPHANT BRAND "Phosphor Bronze"

INGOTS, CASTINGS, WIRE, RODS, SHEETS, Etc.

— DELTA METAL —

CASTINGS, STAMPINGS AND FORGINGS

ORIGINAL AND SOLE MAKERS IN THE U. S.

ACID OPEN HEARTH

STEEL CASTINGS

Also Gray Iron Castings

NF

NATIONAL FOUNDRY CO.

Erie, Pa.

Parkesburg Charcoal Iron Boiler Tubes

made from the same grade of skelp which we have manufactured for forty years.

PARKESBURG IRON COMPANY

PARKESBURG, PA.

BEALS & COMPANY

BUFFALO, N. Y.

Iron, Steel and Hardware

Bars, Beams, Angles, Sheets and Plates

Largest Stock in New York State

Send for Stock List

HIGH PRESSURE OPEN HEARTH STEEL PIPE FITTINGS

Also Cupola and Air Furnace Castings, Hydraulic and Rolling Mill Machinery, The Jackson Belt Lacer, Wagner Cold Saw, Charging Boxes, and special machinery for any purpose. Our prices are right. *Send for catalog.*

Birdsboro Steel Foundry & Machine Co.

Birdsboro, Pa.

BARS (Iron and Steel)—Continued.
Pittsburg Steel Construction Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

BARS (Sheet).
Carnegie Steel Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
LaBelle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

BARS (Splice).
Carnegie Steel Co., Pittsburg, Pa.
Central Track Supply Co., Springfield, O.
Lackawanna Steel Co., New York City.
North Works, Chicago, Ill.

BATTERIES (Storage).
Westinghouse Machine Co., E. Pittsburg, Pa.

BEARINGS.
Auburn Ball Bearing Co., Rochester, N. Y.
Caldwell, H. W., & Son Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Phosphor-Bronze Smelting Co., Philadelphia, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.

BELLOWS (Foundry).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

BELTING.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Palmer-Bee Co., Detroit, Mich.

BELTING (Link).
Caldwell, H. W., & Son Co., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
New Jersey Fdry. & Mch. Co., New York City.
Ohio Malleable Iron Co., Columbus, O.
Palmer-Bee Co., Detroit, Mich.
Port Huron Engine & Thresher Co., Port Huron, Mich.

BELTS (Conveying).
Caldwell, H. W., & Son Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Palmer-Bee Co., Detroit, Mich.

BENCHES (Draw and Wire).
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Watson-Stillman Co., New York City.

BILLETS.
American Steel & Wire Co., Chicago, Ill.
Carnegie Steel Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
North Works, Chicago, Ill.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.

BINS (Ore, Coal, Storage, Etc.).
Pittsburg Steel Construction Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.

BLOCKS (Chain).
Chisholm & Moore Mfg. Co., Cleveland, O.
New Jersey Fdry. & Mch. Co., New York City.

BLOCKS (Cupola).
American Refractories Co., Chicago, Ill.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.
Stowe-Fuller Co., Cleveland, O.

BLOOMS.
Carnegie Steel Co., Pittsburg, Pa.
Hillman, J. H., & Son, Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Chicago, Ill.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
National Tube Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Wood, Alan, Iron & Steel Co., Philadelphia.

BLOWERS.
Cameron, A. S., Steam Pump Works, New York City.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Green Fuel Economizer Co., Matteawan, N. Y.
Obermayer Co., S., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

BOILERS.
Baird Machinery Co., Pittsburg, Pa.
Chicago House Wrecking Co., Chicago, Ill.
Cooper, C. & G., Co., Mt. Vernon, O.
Davis, W. P., Machine Co., Rochester, N. Y.
Dravo, Doyle & Co., Pittsburg, Pa.
Harrison Safety Boiler Works, Philadelphia.
Hathaway, A. G., & Co., Cleveland, O.
Industrial Works, Bay City, Mich.
Lake Erie Engine Works, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Petroleum Iron Works Co., Sharon, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Randle Machinery Co., Cincinnati, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Standard Boiler & Plate Iron Co., Niles, O.
Struthers-Wells Co., Warren, Pa.
Toomey, Frank, Philadelphia, Pa.
Vandyck-Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.

BOLTS.
American Bridge Co., New York City.
Chicago Screw Co., Chicago, Ill.
Graham Nut Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

BOOKS.
Penton Publishing Co., Cleveland, O.

BOXES (Annealing).
Meehan Boiler & Construction Co., Lowellville, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wilfong Bros., Philadelphia, Pa.

BOXES (Charging).
Meehan Boiler & Construction Co., Lowellville, O.
Morgan Engineering Co., Alliance, O.

BOXES (Tote) (Steel).
Avery Stamping Co., Cleveland, O.
Caldwell, H. W., & Son Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, O.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.

BRACES (Rail).
Central Track Supply Co., Springfield.

BRAZING (Custom).
Champion Engineering Co., Cleveland, O.

BREAKERS (Casting).
Curtis & Co. Mfg. Co., St. Louis, Mo.

BREAKERS (Circuit).
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

BRICK AND CLAY (Fire).
American Refractories Co., Joliet, Ill.
Ashland Fire Brick Co., Ashland, Ky.
Bickford Fire Brick Co., Pittsburg, Pa.
Blackwell, Geo. G., Sons & Co., Liverpool.
Carborundum Co., Niagara Falls, N. Y.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Kenworthy Engineering Co., Waterbury, Conn.
Negley Clay Co., Negley, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Obermayer, S., Co., Cincinnati, O.
Ohio Fire Brick Co., Oak Hill, O.
Scioto Fire Brick Co., Sciotoville, O.
Stowe-Fuller Co., Cleveland, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stevens, F. B., Detroit, Mich.
Swank's Sons, Hiram, Johnstown, Pa.

BRICK (Silica, Magnesia, Chrome).
American Refractories Co., Joliet, Ill.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stowe-Fuller Co., Cleveland, O.

BRIDGES AND VIADUCTS (Steel).
American Bridge Co., New York City.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Interstate Engineering Co., Cleveland, O.
McClintic-Marshall Construction Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.

BRUSHES (Foundry).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

BUCKETS (Clam Shell).
Interstate Engineering Co., Bedford, O.
Macbeth Iron Co., Cleveland, O.
McMyler Mfg. Co., Cleveland, O.
New Jersey Fdry. & Machine Co., New York City.
Wellman-Seaver-Morgan Co., Cleveland, O.

BUCKETS (Elevator and Hoisting).
Bartlett, C. O., & Snow Co., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Caldwell, H. W., & Son Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
McMyler Mfg. Co., Cleveland, O.
Ohio Malleable Iron Co., Columbus, O.
Palmer-Bee Co., Detroit, Mich.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

BUGGIES (Wire and Nail Mill).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BULLDOZERS.
Cleveland Punch & Shear Works Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.
National Machinery Co., Tiffin, O.
Williams, White & Co., Moline, Ill.

BULLDOZERS (Hydraulic).
Chambersburg Engineering Co., Chambersburg, Pa.

BURNERS (Fuel Oil).
Petroleum Iron Works Co., Sharon, Pa.

CABLEWAYS.
Flory, S., Manufacturing Co., Bangor, Pa.
McClintic-Marshall Construction Co., Pittsburg, Pa.

CARBORUNDUM.
Carborundum Co., Niagara Falls, N. Y.

CARS (Annealing, Pig Iron, Etc.).
Chase Foundry & Mfg. Co., Columbus, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Billet).
Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Charging).
Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Coal, Coke and Mining).
Jeffrey Mfg. Co., Columbus, O.
Massillon Fdry. & Machine Co., Massillon, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Electrically Driven).
Atlas Car Mfg. Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Westinghouse Machine Co., E. Pittsburg, Pa.

CARS (Industrial).
Atlas Car Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Tank).
Meehan Boiler & Construction Co., Lowellville, O.
Standard Boiler & Plate Iron Co., Niles, O.

CASTINGS (Auto).
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Canton Brass Co., Canton, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Ohio Malleable Iron Co., Columbus, O.
Walker Foundry Co., Erie, Pa.

STEEL CASTINGS

Otis Steel

Flange Plates

Ship Plates Tank Plates

Steel Car Axles

Forgings of all kinds

"Otis"

Fire Box Plates a Specialty

Steel Castings

From 100 to 100,000 pounds.

WEIGHT, 55,000 LBS.

THE OTIS STEEL CO., Limited

Head Office and Works, CLEVELAND, O.

NEW YORK, John Platt & Co., 97 Cedar St.

AGENCIES

DETROIT, George W. House, Union Trust Building

MONTREAL, Taylor & Arnold, 180 St. James St.

THE

BUCYRUS STEEL CASTING CO.

Bucyrus, Ohio

BASIC OPEN HEARTH STEEL CASTINGS

Capacity 100 Tons Daily
Castings Up to 50,000 Lbs.

PROMPT DELIVERY OUR LONG SUIT

Good, Sound, Tough Castings Our Specialty

GIVE US A TRIAL.

NICKEL, MANGANESE, TUNGSTEN and VANADIUM

CRUCIBLE STEEL CASTINGS

CHICAGO STEEL FOUNDRY CO.

Foundry, 19th and Rockwell Sts.
CHICAGO

Offices, Rookery Bldg.
CHICAGO

STEEL CASTINGS

CRUCIBLE STEEL CASTINGS—MANGANESE STEEL CASTINGS
SOUNDEST—HIGHEST TENSILE STRENGTH—SMOOTHEST

THE PRIME STEEL CO. Milwaukee, Wis.

CASTINGS (Brass, Bronze and Aluminum).

Canton Brass Co., Canton, O.
Dake Engine Co., Grand Haven, Mich.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Mesta Machine Co., Pittsburg, Pa.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Powell, Wm., Co., Cincinnati, O.
United Engineering & Foundry Co., Pittsburg, Pa.

CASTINGS (Crucible Steel).

Chicago Steel Foundry Co., Chicago, Ill.
Prime Steel Co., Milwaukee, Wis.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS (Die).

Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.

CASTINGS (Galvanized).

Cleveland Galvanizing Works Co., Cleveland, O.
Walker Foundry Co., Erie, Pa.

CASTINGS (Gray Iron).

American Bridge Co., New York City.
Ball Engine Co., Erie, Pa.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Birmingham Iron Foundry, Derby, Conn.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Dake Engine Co., Grand Haven, Mich.
Farrel Fdry. & Machine Co., Ansonia, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Green Engineering Co., Chicago, Ill.
Hubley Mfg. Co., Lancaster, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Marshall Foundry Co., Pittsburg, Pa.
Massillon Fdry. & Machine Co., Massillon, O.
McLanahan-Stone Machine Co., Hollidaysburg.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Shelby Foundry Co., Shelby, O.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Taylor & Boggis Foundry Co., Cleveland, O.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Foundry Co., Pittsburg, Pa.
United States Cast Iron Pipe & Foundry Co., New York City.
Walker Foundry Co., Erie, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Car Mfg. Co., Youngstown, O.
Youngstown Fdy. & Mach. Co., Youngstown, O.

CASTINGS (Gray Iron, Car and Locomotive.)

Ball Engine Co., Erie, Pa.
Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
Hubley Mfg. Co., Lancaster, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
National Foundry Co., Erie, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Walker Foundry Co., Erie, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CASTINGS (Gray Iron Machinery).

Taylor & Boggis Foundry Co., Cleveland, O.
Walker Foundry Co., Erie, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CASTINGS (Light Gray Iron).

Taylor & Boggis Foundry Co., Cleveland, O.
Walker Foundry Co., Erie, Pa.

CASTINGS (Malleable).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Albion Malleable Iron Co., Albion, Mich.
Chisholm & Moore Mfg. Co., Cleveland, O.
Dayton Malleable Iron Co., Dayton, O.
Erie Malleable Iron Co., Erie, Pa.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Galesburg Mall. Castings Co., Galesburg, Ill.
Grand Rapids Malleable Works, Grand Rapids, Mich.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Meadville Malleable Iron Co., Meadville, Pa.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Northern Malleable Iron Co., St. Paul, Minn.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Standard Malleable Iron Co., Muskegon, Mich.
Union Malleable Iron Co., East Moline, Ill.
Waukesha Malleable Iron Co., Waukesha, Wis.
West Virginia Malleable Iron Co., Point Pleasant, W. Va.
Wisconsin Malleable Iron Co., Milwaukee, Wis.

CASTINGS (Malleable, Car and Locomotive).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Albion Malleable Iron Co., Albion, Mich.
Dayton Malleable Iron Co., Dayton, O.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Northwestern Mall. Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Union Malleable Iron Co., East Moline, Ill.

CASTINGS (Semi-Steel).

Ball Engine Co., Erie, Pa.
Birmingham Iron Foundry, Derby, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Mesta Machine Co., Pittsburg, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Walker Foundry Co., Erie, Pa.

CASTINGS (Steel).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bucyrus Steel Casting Co., Bucyrus, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Evans, David, & Co., Chicago, Ill.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Massachusetts Steel Casting Co., Everett, Mass.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Otis Steel Co., Cleveland, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Prime Steel Co., Milwaukee, Wis.
Riverside Steel Casting Co., Newark, N. J.
Sharon Foundry Co., Sharon, Pa.
Solid Steel Casting Co., Chester, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Youngstown Fdy. & Mach. Co., Youngstown, O.

CASTINGS (Steel, Electrical.)

Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS (Steel, Car and Locomotive).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Bucyrus Steel Casting Co., Bucyrus, O.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Otis Steel Co., Cleveland, O.
Prime Steel Co., Milwaukee, Wis.
Pratt & Letchworth Co., Buffalo, N. Y.
Riverside Steel Casting Co., Newark, N. J.
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

CASTINGS (Stove Plate).

Taylor & Boggis Foundry Co., Cleveland, O.

CASTINGS (Vanadium).

Mesta Machine Co., Pittsburg, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.

CEMENT

American Refractories Co., Chicago, Ill.
Universal Portland Cement Co., Chicago, Ill.

CHAINS.

Beals & Co., Buffalo, N. Y.
Jones & Laughlin Steel Co., Pittsburg, Pa.

CHAPLETS.

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CHARCOAL.

Hillman, J. H., & Son, Pittsburg, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CHEMISTS (Analytical).

Emmerton, F. A., Cleveland, O.
Hunt, R. W., & Co., Chicago, Ill.
Peck, Francis J., & Co., Cleveland, O.

CHEMISTS (Manufacturing).

Grasselli Chemical Co., Cleveland, O.

CHISELS (Cold).

Anderson Forge & Machine Co., Detroit, Mich.

CLUTCHES.

Brown Hoisting Machinery Co., Cleveland, O.
Cincinnati Iron Store Co., Cincinnati, O.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Fdry. & Machine Co., Ansonia, Conn.
Palmer-Bee Co., Detroit, Mich.

CLUTCHES (Induction.)

Wheeling Mold & Fdy. Co., Wheeling, W. Va.

COAL AND COKE.

Baird & West, Detroit, Mich.
Bessemer Coke Co., Pittsburg, Pa.
Blair, Reed F., & Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Columbus Iron & Steel Co., Columbus, O.
DeCamp Bros. & Yule Iron, Coal & Coke Co., St. Louis, Mo.
Eaton, Rhodes & Co., Cincinnati, O.
Debevoise, Anderson & Co., New York City.
Hammond-Byrd Co., Birmingham, Ala.
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Son, Pittsburg, Pa.
Jamison Coal & Coke Co., Pittsburg, Pa.
La Belle Iron Works Co., Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mudge & Co., Edmund W., Pittsburg, Pa.
Rogers, Brown & Co., Cincinnati, O.
Shanklin, Jas. R., & Co., Cincinnati, O.
Stewart Iron Co., Ltd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Thompson, W. H., & Co., Philadelphia, Pa.
Walter-Wallingford & Co., Cincinnati, O.
Washington Coal & Coke Co., Pittsburg, Pa.
Wister & Co., L. & R., Philadelphia, Pa.

COCKS (Gage).

Chaplin Fulton Mfg. Co., Pittsburg, Pa.
Jenkins Bros., New York City.
Wright Mfg. Co., Detroit, Mich.

COILS (Pipe).

Green Fuel Economizer Co., Matteawan, N. Y.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Rempe Co., Chicago, Ill.

COLUMNS (Water).

Wright Mfg. Co., Detroit, Mich.

COLUMNS (Water Alarm).

Wright Mfg. Co., Detroit, Mich.

COMPOUND (Core).

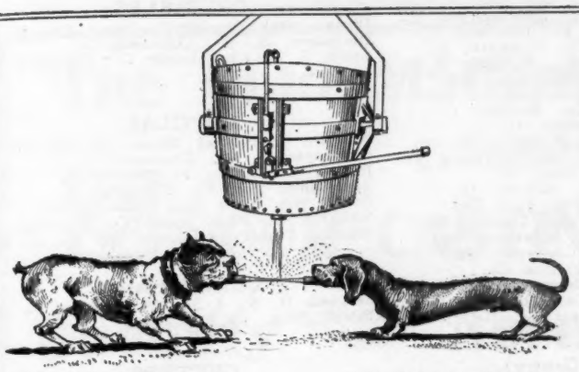
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

COMPRESSORS (Air).

American Air Compressor Works, New York City.
Baird Machinery Co., Pittsburg, Pa.
Bury Compressor Co., Erie, Pa.
Cameron, A. S., Steam Pump Works, New York City.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Deming Bros., Salem, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
McGowan, John H., Co., Cincinnati, O.
Mesta Machine Co., Pittsburg, Pa.
Niagara Device Co., Buffalo, N. Y.
Norwalk Iron Works Co., So. Norwalk, Conn.
Scully Steel & Iron Co., Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Wickes Bros., Pittsburg.
Wisconsin Engine Co., Corliss, Wis.

COMPRESSORS (Gas).

Bury Compressor Co., Erie, Pa.
Norwalk Iron Works Co., So. Norwalk, Conn.



TENSILE STRENGTH ELONGATION.

STRONG STEEL CASTINGS

THE TOUGHEST METAL EVER PRODUCED

NEW METHODS

Castings made by our improved methods in acid open hearth steel manufacture, are absolutely solid, always uniform, thoroughly reliable, and have exceptional strength and ductility.

Lighten your patterns, send them to us and receive castings with increased strength at less cost.

STRONG STEEL FOUNDRY CO.,
Buffalo, N. Y.

True to Pattern

STEEL AND MALLEABLE CASTINGS

Quality unsurpassed.

ACME
STEEL & MALLEABLE IRON WORKS
Buffalo, N. Y.

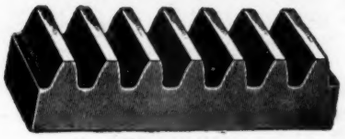
STEEL CASTINGS

Acid Open Hearth

We solicit your business and guarantee satisfaction.

SHARON FOUNDRY COMPANY,
Sharon, Pa.

Don't Spoil a Good Machine
by fitting it with poor racks



We make a specialty of
ACCURATE INVOLUTE TOOTH RACKS,

of any length up to 25 feet, and in 3, 4, 5, 6, 7, 8, 10 or 12 diametrical pitch. *Ask for catalog, or send specifications.*

STANDARD GAUGE STEEL CO., Beaver Falls, Pa., U. S. A.

Pacific Tool & Supply Co., Hall & Pickles, Seattle Hardware Co., San Francisco, Cal. 64 Port St., Manchester, Eng. Seattle, Wash.

SHOP TORCHES

The Dayton Malleable Iron Co.
DAYTON, OHIO.

HIGH GRADE MALLEABLE CASTINGS

JESSOP'S STEEL

Manufactured by
WM. JESSOP & SONS, Ltd.
Established 1774 SHEFFIELD, ENG.

High Speed Air Hardening Steel
Accomplishes Marvelous Work
Indispensible in Up to Date Shops
Large Assortment of Best Tool Steel in Stock at
91 John Street - - New York
and at other agencies in U. S. and Canada

THE UNITED STEEL CO

CANTON, O.

SLABS BILLETS
BASIC OPEN HEARTH STEEL
VANADIUM STEEL
SHEET BAR UNIVERSAL PLATE

CONDENSERS (Steam).
Cameron, A. S., Steam Pump Works, New York City.
Cooper, C. & G., Co., Mount Vernon, O.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
McGowan, John H., Co., Cincinnati, O.
Mesta Machine Co., Pittsburg, Pa.
Prescott, Fred M., Steam Pump Co., Milwaukee, Wis.
Rempe Co., Chicago, Ill.
Southwark Foundry & Machinery Co., Philadelphia, Pa.

CONSTRUCTION (Concrete).
Kratzer, W. N., & Co., Pittsburg, Pa.
Pittsburg Construction Co., Pittsburg, Pa.

CONSTRUCTION (Steel and Iron).
American Bridge Co. of New York, New York City.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Interstate Engineering Co., Cleveland, O.
Kratzer, W. N., & Co., Pittsburg, Pa.
McClintic-Marshall Construction Co., Pittsburg, Pa.
Ohio Boiler Co., Girard, O.
Pittsburg Construction Co., Pittsburg, Pa.
Pittsburg Steel Construction Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Struthers-Wells Co., Warren, O.

CONTROLLERS.
Allen, John F., New York City.
Alliance Machine Co., Alliance, O.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Morgan Engineering Co., Alliance, O.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

CONTROLLERS (Boiler Feed and Open Heater Feed).
Strong, Carlisle & Hammond Co., Cleveland, O.

CONVERTERS (Bessemer).
Petroleum Iron Works Co., Sharon, Pa.
Tod, William, Co., Youngstown, O.

CONVEYORS.
Bartlett, C. O., & Snow Co., Cleveland, O.
Caldwell, H. W., & Son Co., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Interstate Engineering Co., Bedford, O.
Jeffrey Mfg. Co., Columbus, O.
McMyler Mfg. Co., Cleveland, O.

COUNTERSHAFTS.
Norton Co., Worcester, Mass.

COUNTERSHAFTS (Variable Speed).
Norton Co., Worcester, Mass.

COUPLINGS.
Bliss Co., E. W., Brooklyn, N. Y.
Bradley, C. C., & Son, Syracuse, N. Y.
Caldwell, H. W., & Son Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, O.
Dodge Mfg. Co., Mishawaka, Ind.
Electric Controller & Mfg. Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Palmer-Bee Co., Detroit, Mich.

COUPLINGS (Air Hose).
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES (Charging).
Alliance Machine Co., Alliance, O.
Morgan Engineering Co., Alliance, O.
Pawling & Harnischfeger, Milwaukee, Wis.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Electric Traveling).
Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cincinnati Iron Store Co., Cincinnati, O.
Cleveland Crane & Car Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Industrial Works, Bay City, Mich.
Interstate Engineering Co., Bedford, O.
Macbeth Iron Co., Cleveland, O.
Marion Steam Shovel Co., Marion, O.
McIntosh-Hemphill & Co., Ltd., Pittsburg, Pa.
McMyler Mfg. Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger, Milwaukee, Wis.
Ridgway, Craig, & Son, Coatesville, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES (Gantry).
Alliance Machinery Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Car Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Md.
Interstate Engineering Co., Bedford, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Pawling & Harnischfeger, Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES (Hand Traveling).
Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Detroit Hoist & Machine Co., Detroit, Mich.
Guerrlich, F. C., New York, N. Y.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger, Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Hydraulic).
Alliance Machine Co., Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Morgan Engineering Co., Alliance, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

CRANES (Jib).
Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Car Co., Wickliffe, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Industrial Works, Bay City, Mich.
Interstate Engineering Co., Bedford, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger, Milwaukee, Wis.
Ridgway, Craig, & Son, Coatesville, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES (Locomotive).
Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Car Co., Wickliffe, O.
Industrial Works, Bay City, Mich.
Interstate Engineering Co., Bedford, O.
McMyler Mfg. Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Northern Engineering Works, Detroit, Mich.
Wellman-Seaver-Morgan Co., Cleveland, O.

CRANES (Pneumatic).
Brown Hoisting Machinery Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Industrial Works, Bay City, Mich.
Northern Engineering Works, Detroit, Mich.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

CRANES (Special).
Alliance Machine Co., Alliance, O.
Cleveland Crane & Car Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
New Jersey Foundry & Machine Co., New York City.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
United Engineering & Fdy. Co., Pittsburg, Pa.

CRANKSHAFTS (Forged).
Erie Forge Co., Erie, Pa.

CRUCIBLES.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CUPOLAS.
Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons, Pittsburg, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPS (Grease).
Caldwell, H. W., & Son Co., Chicago, Ill.
Powell, Wm., Co., Cincinnati, O.

CUTTERS.
Landis Tool Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.

CUTTERS (Sprue).
Bliss, E. W., Co., Brooklyn, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Toledo Machine & Tool Co., Toledo, O.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

DAUBING (Cupola).
Obermayer, S., Co., Cincinnati, O.

DIES.
Avery Stamping Co., Cleveland, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Consolidated Press & Tool Co., Hastings, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Jones & Lamson Machine Co., Springfield, Vt.
Long & Allstatter Co., Hamilton, O.
Marchant, Geo. F., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

DIES (Forging).
Mesta Machine Co., Pittsburg, Pa.

DREDGES.
Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Thew Automatic Shovel Co., Lorain, O.

DRESSERS (Emery Wheel).
Abrasive Material Co., Philadelphia, Pa.
Carborundum Co., Niagara Falls, N. Y.
Chicago Screw Co., Chicago, Ill.
Cole, J. Wendell, Columbus, O.
Norton Co., Worcester, Mass.
Stow Mfg. Co., Binghamton, N. Y.

DRILLS.
Baird Machinery Co., Pittsburg, Pa.
Baker Bros., Toledo, O.
Celfor Tool Co., Chicago, Ill.
Cincinnati Iron Store Co., Cincinnati, O.
Cincinnati Machine Tool Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Davis, W. P., Machine Co., Rochester, N. Y.
McCabe, J. J., New York City.
Motch & Merryweather Machinery Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Vandyck Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.

DRILLS (Electrical).
Cincinnati Electrical Tool Co., Cincinnati, O.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS (Pneumatic).
Allen, John F., New York City.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.

MALLEABLE IRON CASTINGS

The Ohio Malleable Iron Company

Columbus, Ohio.

OUR CASTINGS COMBINE

Ductility Of Wrought Iron **Accuracy** of Drop Forgings **Strength** of Cast Steel

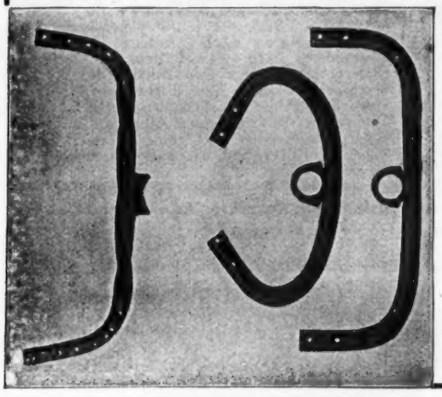
Up to the Full Limit of Malleable Cast Iron Possibilities.

PRATT & LETCHWORTH COMPANY

MALLEABLE AND STEEL CASTINGS

Buffalo, N. Y. (Organized 1848) **Brantford, Canada**

PORT HURON E. & T. CO.



Malleable Castings

This Iron was Bent and Twisted Cold.

Please write us.

Port Huron, Michigan

Meadville Malleable Iron Co.
Meadville, Pa.

Malleable Castings of any description
Satisfaction guaranteed

ERIE MALLEABLE IRON COMPANY

ERIE, PA.

W. H. THOMSON & CO.

Eastern Agents

Youngstown Iron and Steel Roofing Co., Youngstown, O.

Rooms 511-512 Land Title Bldg., PHILADELPHIA, PA.

Iron and Steel, Coal and Coke, Steamship Outfits
Railway Equipment.

MACHINERY For Reducing and Pointing **WIRE**

by Compression or Cold Swaging

Especially adapted to pointing Wire Rods and Wire for Drawing. For Machines or Information, address

S. W. GOODYEAR, Waterbury, Conn.

MALLEABLES

GRAND RAPIDS MALLEABLE WORKS, Grand Rapids, Mich.

DRILLS (Portable).
Bickford Drill & Tool Co., Cincinnati, O.
Stow Mfg. Co., Binghamton, N. Y.

DRILLS (Stoping).
Hanna Engineering Works, Chicago, Ill.

DRILLS (Twist).
Celfor Tool Co., Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

DRIVERS (Pile).
Bucyrus Co., South Milwaukee, Wis.
Industrial Works, Bay City, Mich.
McMyler Mfg. Co., Cleveland, O.

DRYERS (Mold).
Hanna Engineering Works, Chicago, Ill.

DYNAMOS.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

ECONOMIZERS (Fuel).
Green Fuel Economizer Co., Matteawan, N. Y.

ELEVATORS.
Dodge Mfg. Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
McLanahan-Stone Machine Co., Hollidaysburg.
Ridgway, Craig, & Son, Coatesville, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

ENGINEERS AND CONTRACTORS.
American Bridge Co., New York.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Bucyrus Steel Casting Co., Bucyrus, O.
Chaplin-Fulton Mfg. Co., Pittsburg, Pa.
Duff Patents Co., Pittsburg, Pa.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Garrett-Cromwell Engineering Co., Cleveland, O.
Hunt, Robert W., & Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Kennedy, Julian, Pittsburg, Pa.
Kennedy, Walter, Pittsburg, Pa.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Lamond, David, & Son, Pittsburg, Pa.
Laughlin, Alex., & Co., Pittsburg, Pa.
Macbeth Iron Co., Cleveland, O.
McClintic-Marshall Construction Co., Pittsburg, Pa.
McClure, George W., Son & Co., Pittsburg, Pa.
McKee, Arthur G., Cleveland, O.
Meehan Boiler & Construction Co., Lowellville, O.
Morgan Engineering Co., Alliance, O.
Peck, Francis J., & Co., Cleveland, O.
Pittsburg Construction Co., Pittsburg, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Seaver, John W., Cleveland, O.
Smythe, S. R., Co., Pittsburg, Pa.
Swindell, Wm., & Bros., Pittsburg, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

ENGINES (Gas and Gasoline).
Buckeye Engine Co., Salem, O.
Chicago House Wrecking Co., Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Struthers-Wells Co., Warren, Pa.
Tod, Wm., Co., Youngstown, O.

ENGINES (Hoisting).
Brown Hoisting Machinery Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Flory, S., Mfg. Co., Bangor, Pa.
Mesta Machine Co., Pittsburg, Pa.
New Jersey Foundry & Machine Co., New York City.
Wisconsin Engine Co., Corliss, Wis.

ENGINES (Pneumatic).
Chicago House Wrecking Co., Chicago, Ill.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.

ENGINES (Steam).
Ball Engine Co., Erie, Pa.
Buckeye Engine Co., Salem, O.
Chicago House Wrecking Co., Chicago, Ill.
Columbus Iron & Steel Co., Columbus, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Davis, W. P., Machine Co., Rochester, N. Y.
Dravo, Doyle & Co., Pittsburg, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
New Britain Machine Co., New Britain, Conn.
Phoenix Iron Works Co., Meadville, Pa.
Randle Machinery Co., Cincinnati, O.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Struthers-Wells Co., Warren, Pa.
Tod, Wm., Co., Youngstown, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wickes Bros., Pittsburg, Pa.
Wisconsin Engine Co., Corliss, Wis.

EQUIPMENT AND SUPPLIES (Foundry).
Hanna Engineering Works, Chicago, Ill.
Niagara Device Co., Buffalo, N. Y.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

EQUIPMENT (Gas Producer Power Plants).
Morgan Construction Co., Worcester, Mass.

EQUIPMENT (Sand Blast.)
Smith, J. D., Fdry. Supply Co., Cleveland, O.

EXTRACTORS (Steam or Oil).
Austin Separator Co., Detroit, Mich.
Cole, J. Wendell, Columbus, O.
Dravo, Doyle & Co., Pittsburg, Pa.
Harrison Safety Boiler Works, Philadelphia, Pa.
Squires Steam Specialties.
Strong, Carlisle & Hammond Co., Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

FACINGS (Foundry).
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.

FACINGS (Sea Coal).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

FERRO-MANGANESE.
Blackwell, Geo. G., & Sons, Ltd., Liverpool, Eng.
Bond, Vivian, & Co., New York City.
Rogers, Brown & Co., Cincinnati, O.

FERRO-SILICON.
Blackwell, Geo. G., & Sons Co., Ltd., Liverpool, Eng.
Bond, Vivian, & Co., New York City.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

FILES.
Barnett, G. & H., Co., Philadelphia, Pa.
Nicholson File Co., Providence, R. I.

FILLER (Iron).
Obermayer, S., Co., Cincinnati, O.

FILLET (Leather and Wood).
Cleveland Galvanizing Works, Cleveland, O.

FILTERS (Water or Oil).
Harrison Safety Boiler Works, Philadelphia, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Wright Mfg. Co., Detroit, Mich.

FITTINGS (Open Hearth Steel Pipe).
United Engineering & Fdy. Co., Pittsburg, Pa.

FITTINGS (Pipe).
Flagg, Stanley G., & Co., Philadelphia, Pa.
Pittsburg Piping & Equipment Co., Pittsburg, Pa.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, PPa.

FLASKS.
Obermayer, S., Co., Cincinnati, O.

FLOUR (Foundry).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

FLUOR-SPAR.
Fairview Fluor-Spar & Lead Co., New York.

FORGINGS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
Cleveland City Forge & Iron Co., Cleveland, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Columbus Forge & Iron Co., Columbus, O.
Dyson & Son, Jos., Cleveland, O.
Erie Forge Co., Erie, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Hathaway & Co., A. G., Cleveland, O.
Heppenstall Forge & Knife Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Machinery Forging Co., Cleveland, O.
Mesta Machine Co., Pittsburg, Pa.
Ohio Forge Co., Cleveland, O.
Otis Steel Co., Cleveland, O.
Steel Car Forge Co., Pittsburg, Pa.
Toledo Machine & Tool Co., Toledo, O.

FORGINGS (Auto).
Ohio Forge Co., Cleveland, O.

FORGINGS (Copper and Alloy Steel).
Anderson Forge & Machine Co., Detroit, Mich.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Machinery Forging Co., Cleveland, O.
Transue & Williams Co., Alliance, O.
Wyman & Gordon, Cleveland, O.

FORGINGS (Car and Locomotive).
American Iron & Steel Mfg. Co., Lebanon, Pa.
Anderson Forge & Machine Co., Detroit, Mich.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Columbus Forge & Iron Co., Columbus, O.
Heppenstall Forge & Knife Co., Pittsburg, Pa.
Toledo Machine & Tool Co., Toledo, O.
Transue & Williams Co., Alliance, O.

FORGINGS (Drop).
Anderson Forge & Machine Co., Detroit, Mich.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Clapp Mfg. Co., E. D., Auburn, N. Y.
Consolidated Mfg. Co., Toledo, O.
General Drop Forge Co., Buffalo, N. Y.
Machinery Forging Co., Cleveland, O.
Steel Car Forge Co., Pittsburg, Pa.
Transue & Williams Co., Alliance, O.
Wyman & Gordon Co., Cleveland, O., and Worcester, Mass.

FORGINGS (Engine).
Erie Forge Co., Erie, Pa.

FORGINGS (Machined).
Erie Forge Co., Erie, Pa.

FORGINGS (Machinery).
Columbus Forge & Iron Co., Columbus, O.
Machinery Forging Co., Cleveland, O.

FORKS AND HOES.
American Fork & Hoe Co., Cleveland, O.

FROGS AND SWITCHES (Industrial).
Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Wiener Co., Ernst, New York, N. Y.

FURNACES (Annealing).
Green Engineering Co., Chicago, Ill.
Kenworthy Engineering Co., Waterbury, Conn.
McClure, Son & Co., G. W., Pittsburg, Pa.
Swindell & Bros., Wm., Pittsburg, Pa.

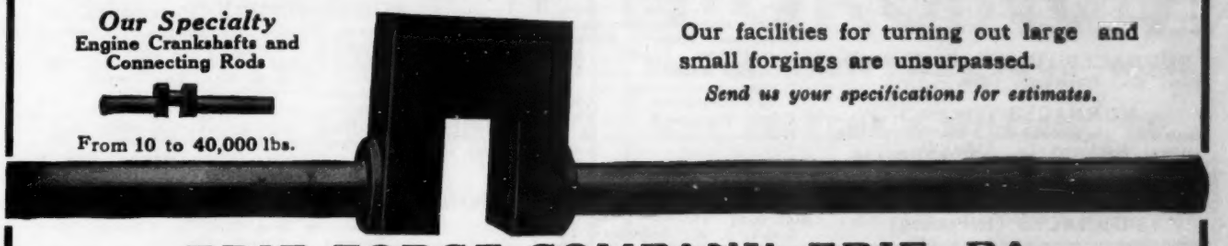
FURNACES (Blast).
Garrett-Cromwell Engineering Co., Cleveland, O.
Kennedy, Julian, Pittsburg, Pa.
Kennedy, Walter, Pittsburg, Pa.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
McKee, Arthur, Cleveland, O.
McClure, Son & Co., G. W., Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Smythe Co., S. R., House Bldg., Pittsburg, Pa.
Standard Boiler & Plate Iron Co., Niles, O.
Swindell & Bros., Wm., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

FORGINGS

FORGINGS

Our Specialty
Engine Crankshafts and Connecting Rods

From 10 to 40,000 lbs.



Our facilities for turning out large and small forgings are unsurpassed.
Send us your specifications for estimates.

ERIE FORGE COMPANY, ERIE, PA.

FORGINGS
STEEL CAR FORGE CO.
PITTSBURG, PA.

FORGINGS for Machine Tool Builders

THE MACHINERY FORGING COMPANY
CLEVELAND, OHIO

GENERAL DROP FORGE CO.
SPECIAL DROP FORGINGS TO ORDER.
BUFFALO, N. Y.

FORGINGS
Of Every Description.
TURNBUCKLES.
THE COLUMBUS FORGE & IRON CO.
Columbus, Ohio
Your Inquiries Please

UNITED IRON WORKS CO.
Successor to
Freeman Foundry & Mfg. Co.
Largest Manufacturers of Mining Machinery in the West
Office and Works, cor. Main and 14th Sts., JOPLIN, MO.
Telephone 51

Drop Forgings
For AUTOMOBILES and MACHINERY MANUFACTURERS

TRADE A MARK
ANDERSON FORGE & MACHINE CO.
DETROIT, MICH.

STEAM HAMMER FORGED
HIGH GRADE CRANK SHAFTS
EITHER ROUGH-FORGED OR COMPLETELY MACHINED.
COLD CHISELS

FURNACES (Blueing).
Kenworthy Engineering Co., Waterbury, Conn.

FURNACES (Brass and Copper Melting).
Swindell & Bros., Wm., Pittsburg, Pa.

FURNACES (Crucible).
Kenworthy Engineering Co., Waterbury, Conn.
Laughlin & Co., Alex., Pittsburg, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Swindell & Bros., Wm., Pittsburg, Pa.

FURNACES (Electrically Heated).
Bristol Co., Waterbury, Conn.

FURNACES (Forging).
Kenworthy Engineering Co., Waterbury, Conn.
National Machinery Co., Tiffin, O.

FURNACES (Melting).
Kenworthy Engineering Co., Waterbury, Conn.

FURNACES (Reheating).
Green Engineering Co., Chicago, Ill.
Kenworthy Engineering Co., Waterbury, Conn.
Morgan Construction Co., Worcester, Mass.

FURNITURE (Shop).
New Britain Machine Co., New Britain, Conn.

GALVANIZING.
Avery Stamping Co., Cleveland, O.
Cleveland Galvanizing Works Co., Cleveland, O.
Empire Iron & Steel Co., Niles, O.

GEARS.
Bilgram, Hugo, Philadelphia, Pa.
Caldwell & Son Co., H. W., Chicago, Ill.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Foundry & Machine Co., Ansonia, Conn.
Foote Bros. Gear & Machine Co., Chicago, Ill.
Ganschow Co., Wm., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
Mesta Machine Co., Pittsburg, Pa.
Newark Gear Cutting Machine Co.,Newark, N.J
New Process Rawhide Co., Syracuse, N. Y.
Palmer-Bee Co., Detroit, Mich.
Philadelphia Gear Works, Philadelphia, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Van Dorn & Dutton Co., Cleveland, O.

GEARS (Bevel).
Mesta Machine Co., Pittsburg, Pa.
New Process Rawhide Co., Syracuse, N. Y.
Van Dorn & Dutton Co., Cleveland, O.

GEARS (Cast Steel, Mach. Molded).
Mesta Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Van Dorn & Dutton Co., Cleveland, O.

GEARS (Cut)
Mesta Machine Co., Pittsburg, Pa.
New Process Rawhide Co., Syracuse, N. Y.
Van Dorn & Dutton Co., Cleveland, O.

GEARS (Rawhide).
New Process Rawhide Co., Syracuse, N. Y.
Van Dorn & Dutton Co., Cleveland, O.

GEARS (Swinging).
Dake Engine Co., Grand Haven, Mich.

GENERATORS (Direct and Alternating).
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

GLASSES (Gage Boiler).
Strong, Carlisle & Hammond Co., Cleveland, O.

GOVERNORS (Pump).
Chaplin-Fulton Mfg. Co., Pittsburg, Pa.
Dean Bros. Steam Pump Works, Indianapolis.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
McGowan Co., John H., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Squires Steam Specialties.
Wood & Co., R. D., Philadelphia, Pa.

GRAPHITE.
Dixon Crucible Co., Jos., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

GRATES.
Green Engineering Co., Chicago, Ill.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Vulcan Iron Works Co., Toledo, O.

GRINDERS (Electrical).
Cincinnati Electrical Tool Co., Cincinnati, O.

HAMMERS (Belt Driven).
Beaudry & Co., Boston, Mass.
Bradley & Son, C. C., Syracuse, N. Y.

HAMMERS (Drop).
Alliance Machine Co., Alliance, O.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg.
Heppenstall Forge & Knife Co., Pittsburg, Pa.
Merrill Bros., Brooklyn, N. Y.
Michigan Mach. & Mfg. Co., Ypsilanti, Mich.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Toledo Machine & Tool Co., Toledo, O.
Waterbury Farrel Fdy. & Mch. Co., Waterbury, Conn.
Wickes Bros., Pittsburg, Pa.
Williams, White & Co., Moline, Ill.

HAMMERS (Helve).
Lingle, J. H., Bellefonte, Pa.

HAMMERS (Pneumatic).
Bliss Co., E. W., Brooklyn, N. Y.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

HAMMERS (Power).
Alliance Machine Co., Alliance, O.
Beaudry & Co., Inc., Boston, Mass.
Bliss Co., E. W., Brooklyn, N. Y.
Bradley & Sons, C. C., Syracuse, N. Y.
Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
Chambersburg Engineering Co., Chambersburg.
Cleveland Punch & Shear Works, Cleveland, O.
Massillon Fdry. & Machine Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Toledo Mch. & Tool Co., Toledo, O.
Waterbury Farrel Fdy. & Mch. Co., Waterbury, Conn.
Williams, White & Co., Moline, Ill.

HAMMERS (Steam).
Alliance Machine Co., Alliance, O.
Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
Chambersburg Engineering Co., Chambersburg.
Massillon Fdry. & Machine Co., Massillon, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.

HAMMERS (Steam Gravity Drop).
Massillon Fdry. & Machine Co., Massillon, O.

HANGERS.
Caldwell & Son Co., H. W., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Globe Rolling Mill Co., Cincinnati, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Palmer-Bee Co., Detroit, Mich.

HEADS (Exhaust).
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Wright Mfg. Co., Detroit, Mich.

HEATERS (Feed Water).
Green Fuel Economizer Co., Matteawan, N. Y.
Harrison Safety Boiler Works, Philadelphia, Pa.
McGowan Co., John H., Cincinnati, O.
Petroleum Iron Works Co., Sharon, Pa.
Phoenix Iron Works Co., Meadville, Pa.

HOISTS (Chain).
Brown Hoisting Machinery Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Crane & Car Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
New Jersey Fdry. & Mach. Co., New York.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger, Milwaukee, Wis.

HOISTS (Electric).
Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Cincinnati Iron Store Co., Cincinnati, O.
Cleveland Crane & Car Co., Wickliffe, O.
Cleveland Punch & Shear Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., Columbus, O.
McMyler Mfg. Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
New Jersey Fdry. & Machine Co., New York.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger, Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS (Hand).
Cleveland Crane & Car Co., Wickliffe, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
New Jersey Fdry. & Machine Co., New York.
Pawling & Harnischfeger, Milwaukee, Wis.

HOISTS (Pneumatic).
Brown Hoisting Machinery Co., Cleveland, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Mch. Co., Detroit, Mich.
Independent Pneumatic Tool Co., Chicago, Ill.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig, & Son, Coatesville, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

HOLDERS (Tool).
Armstrong Bros. Tool Co., Chicago, Ill.
Bardons & Oliver, Cleveland, O.
Cole, J. Wendell, Columbus, O.

HOOPS (Steel).
American Steel & Wire Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Cincinnati Iron Store Co., Cincinnati, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Pittsburg Steel Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

HOSE (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

INDICATORS (Revolution).
Brown & Son, Edward, Philadelphia, Pa.
Uehling Instrument Co., Passaic, N. J.

INJECTORS.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Jenkins Bros., New York City.
Powell Co., Cincinnati, O.
Randle Machinery Co., Cincinnati, O.
Watson, N. A., Erie, Pa.

IRON (Forging).
Clinton Iron & Steel Co., Pittsburg, Pa.
Globe Rolling Mill Co., Cincinnati, O.

IRON (Pig.)
Blair & Co., Reed F., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg, Pa.
Columbus Iron & Steel Co., Columbus, O.
Corrigan, McKinney & Co., Cleveland, O.
Debevoise-Anderson Co., New York City.
DeCamp Bros. & Yule Iron, Coal & Coke Co., St. Louis, Mo.
Eaton, Rhodes & Co., Cincinnati, O.
Evans, David, Chicago, Ill.
Hammond Byrd Co., Birmingham, Ala.
Hanna & Co., M. A., Cleveland, O.
Hickman, Williams & Co., Chicago, Ill.
Hillman & Son, J. H., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lea & Co., J. Tatnall, Philadelphia, Pa.
McKeefrey & Co., Leetonia, O.
Mitchell Diggins Iron Co., Cadillac, Mich.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Rogers, Brown & Co., Cincinnati, O.
Shenango Furnace Co., Pittsburg, Pa.
Stevens, F. B., Detroit, Mich.
Stewart Iron Co., Cleveland, O.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Thomas Furnace Co., Milwaukee, Wis.
Upson Nut Co., Cleveland, O.
Walter-Wallingford & Co., Cincinnati, O.
Wister & Co., L. & R., Philadelphia, Pa.

IRON AND STEEL (Scrap).
American Bridge Co., New York City.
Bourne-Fuller Co., Cleveland, O.
Hathaway & Co., A. G., Cleveland, O.
Kander, H., Bowling Green, O.
Mudge & Co., Edmund, Pittsburg, Pa.
Nicoll & Co., B., Chicago, Ill.
Richardson & Co., Pittsburg, Pa.

IRON AND STEEL (Galvanized).
American Sheet & Tin Plate Co., Pittsburg, Pa.
Buffalo Steel Co., Tonawanda, N. Y.
Cincinnati Iron Store Co., Cincinnati, O.

SHEAR KNIVES
of Every Description

Miscellaneous
FORGINGS

Heppenstall Forge & Knife Company
PITTSBURG, PA.
Successors to PITTSBURG SHEAR KNIFE & MACHINE CO.

DROP FORGINGS
Let us know what YOU want.
THE TRANSUE & WILLIAMS CO.
ALLIANCE, O.
1105 Monadnock Block, Chicago, Ill.
1030 Land Title Bldg., Philadelphia, Pa.

PATTERNS AND SUPPLIES

THE CLEVELAND CASTINGS PATTERN CO.
Cleveland, Ohio
Successors to
The Gobeille Pattern Company
The Largest Pattern Works in the World

CASTINGS
IN
Brass, Bronze, Aluminum, Manganese and White Metal
ALSO
Metal Patterns
THE CANTON BRASS CO.
Canton, O.

ILLINOIS ZINC CO.
MANUFACTURERS OF
Spelter and Sheet Zinc
PERU, ILL.

THE STANDARD PATTERN WORKS CO.
CLEVELAND, OHIO
WOOD AND METAL PATTERNS
of every description
C. BIRNBAUM, Pres. and Treas.
E. J. GUTMAN, V. Pres. and Gen. Mgr.

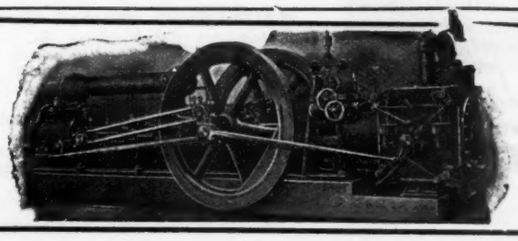
LE CHATELIER **PYROMETERS**
adapted to all industrial purposes.
Electric Furnaces for experimental and laboratory use.
S. H. STUPAKOFF, E. E. Pittsburg, Pa.

THE UEHLING
PNEUMATIC PYROMETER
Single, Double and Multiple Systems; indicates temperatures for attendant; makes continuous record for superintendent.
UEHLING INSTRUMENT CO.
Passaic, N. J.
Also manufacturers of
THE UEHLING GAS-COMPOSIMETER
REVOLUTION RECORDERS and INDICATORS

ALL TYPES OF
PYROMETERS
IN GENERAL USE
Manufactured by
Edward Brown & Son
113 Walnut Street.
PHILADELPHIA, - - PA.

DUFF PATENTS CO. Inc.
Works: Bequet St., N. S., Pittsburg, Pa. | Office: 918 Frick Bldg., Pittsburg, Pa
BUILDERS OF
Duff and Bradley Patent Water Seal Gas Producers.
Stacks, Tanks, and All Kinds of Heavy and Light Plate Work.

AIR COMPRESSORS
PNEUMATIC TOOLS
CATALOGUES GRATIS
AMERICAN AIR COMPRESSOR WORKS,
26 Cortlandt St., New York, U. S. A.



AIR AND GAS COMPRESSORS
For latest improvements address
THE NORWALK IRON WORKS CO.
South Norwalk, Conn.

IRON AND STEEL (Galvanized)—Continued.

Cleveland Galvanizing Works, Cleveland, O.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Wood & Co., Alan, Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

JOINTS (Rail).

Chisholm & Moore Mfg. Co., Cleveland, O.
Lackawanna Steel Co., New York City.

KETTLES (Galvanizing.)

Wilfong Bros., Philadelphia, Pa.

KEYS AND CUTTERS (Machine).

Standard Gauge Steel Co., Beaver Falls, Pa.

KEYSEATERS.

Baker Bros., Toledo, O.
Ryerson, Jos. T., & Son, Chicago, Ill.

KNIVES (Shear).

Heppenstall Forge & Knife Co., Pittsburg, Pa.

LADLES.

Lake Erie Boiler Works, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Petroleum Iron Works Co., Sharon, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Smith Fdry. Supply Co., J. D., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

LAMPS.

Obermayer, S., Co., Cincinnati, O.
Smith Fdry. Supply Co., J. D., Cleveland, O.

LAMPS (Arc).

General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

LAMPS (Incandescent).

General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

LATHES.

Baird Machinery Co., Pittsburg, Pa.
Bardons & Oliver, Cleveland, O.
Bickford Drill & Tool Co., Cincinnati, O.
Cincinnati Iron Store Co., Cincinnati, O.
Davis Machine Co., W. P., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
G. M. Lathe Co., Cleveland, O.
Jones & Lamson Machy. Co., Springfield, Vt.
LeBlond Machine Tool Co., R. K., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati, O.
McCabe, J. J., New York City.
Motch & Merryweather Mach. Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Schumacher & Boye, Cincinnati, O.
Vandyck, Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.
Williams, White & Co., Moline, Ill.

LATHES (Engine).

G. M. Lathe Co., Cleveland, O.

LEAD.

Fairview Fluor-Spar & Lead Co., New York.

LETTERS (Pattern).

Cleveland Galvanizing Works Co., Cleveland, O.
Cleveland Steel Stamp Works, Cleveland, O.

LUBRICATORS.

Eynon-Evans Mfg. Co., Philadelphia, Pa.
Powell Co., Wm., Cincinnati, O.

LUMBER (Boxing, Crating, Flask and Pattern).

Johnson Lumber Co., Milwaukee, Wis.

MACHINERY (Automatic Gear Cutting).

Motch & Merryweather Machy. Co., Cleveland, O.

MACHINERY (Automatic Screw).

Bardons & Oliver, Cleveland, O

MACHINERY (Band Saw Filing).

New Britain Machine Co., New Britain, Conn.

MACHINERY (Bending and Straightening).

Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro.
Bliss Co., E. W., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg.
Cincinnati Iron Store Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Mach. Works, Philadelphia, Pa.
Long & Alstatter Co., Hamilton, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Stoever Foundry & Mfg. Co., Myerstown, Pa.
Toledo Mach. & Tool Co., Toledo, O.
United Engrg. & Fdry. Co., Pittsburg, Pa.
Watson-Stillman Co., New York City.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Wickes Bros., Pittsburg, Pa.
Williams, White & Co., Moline, Ill.

MACHINERY (Blue Printing).

Buckeye Engine Co., Salem, O.
Youngstown Car Mfg. Co., Youngstown, O.

MACHINERY (Bolt and Nut).

Acme Mach. Co., Cleveland, O.
Baird Machinery Co., Pittsburg, Pa.
Davis Mach. Co., W. P., Rochester, N. Y.
National Mach. Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Williams Tool Co., Erie, Pa.
Williams, White & Co., Moline, Ill.

MACHINERY (Boring and Turning).

Baker Bros., Toledo, O.
Bickford Drill & Tool Co., Cincinnati, O.
Espen-Lucas Mach. Works, Philadelphia, Pa.
McCabe, J. J., New York City.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Warner & Swasey Co., Cleveland, O.

MACHINERY (Chain Making, Cable).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY (Core) (Foundry).

Smith Fdry. Supply Co., J. D., Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.

MACHINERY (Crushing).

Bartlett & Snow Co., C. O., Cleveland, O.
Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.
Farrell Foundry & Mach. Co., Ansonia, Conn.
Hogg Iron & Steel Foundry Co., Geo. A., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

MACHINERY (Cutting Off) (Cold Metal).

Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Davis Mach. Co., W. P., Rochester, N. Y.
Espen-Lucas Machine Works, Philadelphia, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY (Electric Welding).

Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welding Co., Toledo, O.

MACHINERY (Elevating and Conveying).

Bartlett & Snow Co., C. O., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Dodge Mfg. Co., Mishawaka, Ind.
Flory Mfg. Co., S., Bangor, Pa.
Interstate Engineering Co., Bedford, O.
Jeffrey Mfg. Co., Columbus, O.
McMyler Mfg. Co., Cleveland, O.
New Jersey Fdry. & Mach. Co., New York.
Palmer-Bee Co., Detroit, Mich.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

MACHINERY (Forging).

Acme Mach. Co., Cleveland, O.
Bliss Co., E. W., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg.
Ferracute Machine Co., Bridgeton, N. J.
Merrill Bros., Brooklyn, N. Y.
Morgan Engineering Co., Alliance, O.
National Mach. Co., Tiffin, O.
Toledo Mach. & Tool Co., Toledo, O.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Williams, White & Co., Moline, Ill.

MACHINERY (Galvanizing).

Kenworthy Engineering Co., Waterbury, Conn.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wilfong Bros., Philadelphia, Pa.

MACHINERY (Gear Cutting).

Cincinnati Shaper Co., Cincinnati, O.
Newark Gear Cutting Machine Co., Newark, N.J.

MACHINERY (Grinding).

Cleveland Pneumatic Tool Co., Cleveland, O.
Cole, J. Wendell, Columbus, O.
Davis Mach. Co., W. P., Rochester, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
Landis Tool Co., Waynesboro, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Stow Mfg. Co., Binghamton, N. Y.

MACHINERY (Hydraulic).

Chambersburg Engineering Co., Chambersburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

MACHINERY (Milling).

Cincinnati Milling Mach. Co., Cincinnati, O.
Davis Mach. Co., W. P., Rochester, N. Y.
Espen-Lucas Mach. Works, Philadelphia, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
McCabe, J. J., New York City.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Vandyck Churchill Co., New York City.
Warner & Swasey, Cleveland, O.

MACHINERY (Mining).

Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Interstate Engineering Co., Bedford, O.
Jeffrey Mfg. Co., Columbus, O.
Lake Erie Engineering Works, Buffalo, N. Y.
Lake Shore Engine Works, Marquette, Mich.
Marion Steam Shovel Co., Marion, O.
McLanahan-Stone Machine Co., Hollidaysburg.
Prescott Steam Pump Works, Fred M., Milwaukee, Wis.
Union Foundry & Machine Co., Pittsburg, Pa.
Thew Automatic Shovel Co., Lorain, O.
United Iron Works Co., Joplin, Mo.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wisconsin Engine Co., Corliss, Wis.

MACHINERY (Molding).

Obermayer, S., Co., Cincinnati, O.
Pridmore, Henry E., Chicago, Ill.
Smith Fdry. Supply Co., J. D., Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY (Pipe Mill).

Acme Machinery Co., Cleveland, O.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
National Machinery Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.
Stoever Foundry & Mfg. Co., Myerstown, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Williams Tool Co., Erie, Pa.

MACHINERY (Rolling Mill).

Alliance Machine Co., Alliance, O.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Hogg Iron & Steel Foundry Co., Geo. A., Pittsburg, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., Alliance, O.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Union Foundry & Mach. Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Youngstown Foundry & Machine Co., Youngstown, O.

MACHINERY (Sand Blast).

Niagara Device Co., Buffalo, N. Y.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Smith Fdry. Supply Co., J. D., Cleveland, O.

MACHINERY (Second Hand).

Baird Machinery Co., Pittsburg, Pa.
Champion Engineering Co., Cleveland, O.
Chicago House Wrecking Co., Chicago, Ill.
Columbus Equipment Co., Columbus, O.
Lodge & Shipley Machine Tool Co., Cincinnati, O.
McCabe, J. J., New York City.
Motch & Merryweather Machry. Co., Cleveland, O.

HOWARD WOOD, President Business Established 1828 J. R. JONES, Secretary and Treasurer

ALAN WOOD IRON AND STEEL COMPANY

Manufacturers of
Basic Open Hearth Steel Billets, Blooms, Slabs,
Black and Galvanized Iron and Steel Sheets and Plates,
"A. W. Diamond" and "A. W. Ribbed" Pattern Rolled Steel Floor Plates.

No. 519 ARCH STREET *Sizes Furnished on Application.* PHILADELPHIA

PITTSBURG STEEL CONSTRUCTION COMPANY,

OFFICE: LEWIS BLOCK, PITTSBURG, PA. WORKS, ECONOMY, PA.

STRUCTURAL STEEL AND PLATE WORK

For Buildings, Bridges, Blast Furnace Stacks. Hot Blast Stoves, Tanks and Riveted Pipe.

TURNED SHAFTING

Cold Drawn Round, Hexagon, Square and Flat Steel. Round, Square and Hexagon Screw Stock. Polished Pump and Piston Rods Cold Rolled Strip Steel. Drill Rod.

Largest Stock West of Pittsburg

Our monthly STOCK LIST is yours for the asking.

Pittsburg Shafting Company of Detroit
Detroit, Mich.

STEEL STRUCTURES

BUILDINGS TRESTLES BRIDGES

TANKS

For Air, Gases and Liquids

Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

Only Company Authorized Under the

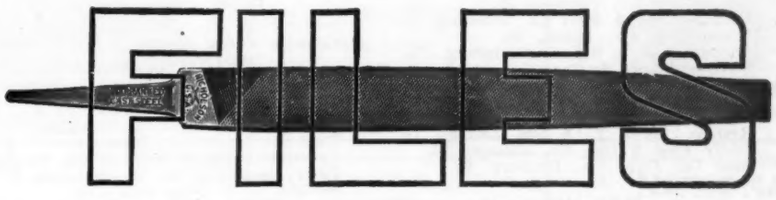
THOMSON ELECTRIC WELDING PATENTS

Machines installed all over the civilized World. Over one hundred U. S. patents.

Beware of Infringers

564331 July 21, 1896 649179 May 8, 1900

THOMSON ELECTRIC WELDING COMPANY, Lynn, Mass.



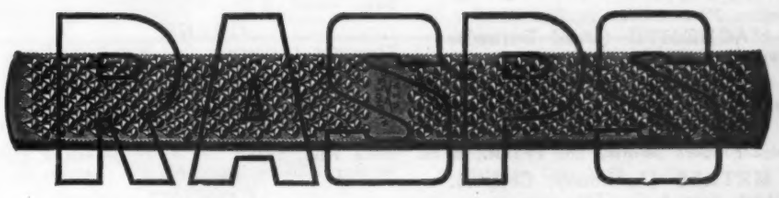
Nicholson
Arcade
American
Great Western
McClellan

Our policy of using the finest steel, tempered and cut according to the best methods known in modern practice, has been the paramount factor in building the

LARGEST FILE BUSINESS IN THE WORLD

NICHOLSON FILE CO.
Providence, R. I.

Kearney & Foot
Eagle
J. B. Smith
"X-F"
Gold Medal



MACHINERY (Second Hand)—Continued.

Niles-Bement-Pond Co., New York City.
Randle Machinery Co., Cincinnati, O.
Reserve Machinery Co., Cleveland, O.
Toomey, Frank, Philadelphia, Pa.
Ward, Wm., Machy. Co., Pittsburg, Pa.
Wickes Bros., Pittsburg, Pa.

MACHINERY (Shovel).

Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Union Foundry & Mach. Co., Pittsburg, Pa.

MACHINERY (Special).

Alliance Machine Co., Alliance, O.
Bilgram, Hugo, Philadelphia, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg.
Consolidated Press & Tool Co., Hastings, Mich.
Foote Bros. Gear & Machine Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, O.
Hogg Iron & Steel Foundry Co., Geo. A., Pittsburg, Pa.
Long & Alstatter Co., Hamilton, O.
Merrill Bros., Brooklyn, N. Y.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Standard Engineering Co., Ellwood City, Pa.
Stoever Foundry & Mfg. Co., Myerstown, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Tod Co., Wm., Youngstown, O.
Union Foundry & Machine Co., Pittsburg, Pa.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Williams, White & Co., Moline, Ill.

MACHINERY (Spike and Nail).

National Mach. Co., Tiffin, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY (Swaging).

Goodyear, S. W., Waterbury, Conn.

MACHINERY (Tapping).

Acme Machinery Co., Cleveland, O.
Baker Bros., Toledo, O.
Cincinnati Machine Tool Co., Cincinnati, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
National Mach. Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.
Stow Mfg. Co., Binghamton, N. Y.
Williams, White & Co., Moline, Ill.

MACHINERY (Thread Rolling).

Acme Machinery Co., Cleveland, O.
Bliss Co., E. W., Brooklyn, N. Y.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY (Tin House).

Birdsboro Steel Foundry & Mach. Co., Birdsboro, Pa.
Hogg Iron & Steel Foundry Co., Geo. A., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Swindell, Wm., & Bros., Pittsburg, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.

MACHINERY (Vitrified Sewer Pipe Complete Equipment).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY (Welding).

Long & Alstatter Co., Hamilton, O.

MACHINERY (Wire Mill, Nail Mill).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINES (Grinding, Portable Pneumatic).

Independent Pneumatic Tool Co., Chicago, Ill.

MACHINISTS.

Hanna Engineering Works, Chicago, Ill.
Massillon Fdry. & Machine Co., Massillon, O.
Van Dorn & Dutton Co., Cleveland, O.

MACHINES (Drilling).

Massillon Fdry. & Machine Co., Massillon, O.

MAGNESITE (Dead Burned).

Stowe-Fuller Co., Cleveland, O.

MAGNETS (Lifting).

Electric Controller & Mfg. Co., Cleveland, O.

METALS (Anti-Friction).

Phosphor-Bronze Smelting Co., Philadelphia, Pa.

METALS (Antimony, Copper).

Blackwell Sons & Co., Ltd., Geo. G., Liverpool, Eng.
Phosphor-Bronze Smelting Co., Philadelphia, Pa.

METALS (Bearing).

Dodge Mfg. Co., Mishawaka, Ind.
Ryerson, Jos. T., & Son, Chicago, Ill.

MILLS (Wire Complete Equipment).

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

MODELS (Made to Order).

Cleveland Castings Pattern Co., Cleveland, O.
Freeman Pattern Co., Toledo, O.
Standard Pattern Co., Cleveland, O.

MOLDS (Ingot).

Carnegie Steel Co., Pittsburg, Pa.
Marshall Foundry Co., Pittsburg, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Youngstown Foundry & Machine Co., Youngstown, O.

MOTORS (Air).

Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Independent Pneumatic Tool Co., Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg.

MOTORS (Electric D. C. & A. C.).

Chicago House Wrecking Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Stow Mfg. Co., Binghamton, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg.

MOVERS (Car).

Niagara Device Co., Buffalo, N. Y.

NAILS.

American Steel & Wire Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Pittsburg Steel Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

NOZZLES (Paint Spraying).

Niagara Device Co., Buffalo, N. Y.

NOZZLES (Sand Blast).

Niagara Device Co., Buffalo, N. Y.

NUTS.

American Bridge Co., New York City.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Cleveland City Forge & Iron Co., Cleveland, O.
Graham Nut Co., Pittsburg, Pa.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Phosphor-Bronze Smelting Co., Philadelphia, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

ORE (Chrome).

American Refractories Co., Chicago, Ill.
Blackwell & Sons Co., Ltd., Geo. G., Liverpool, Eng.
Harbison-Walker Refractories Co., Pittsburg.
Stowe-Fuller Co., Cleveland, O.

ORES (Iron).

Blackwell, Sons & Co., Geo. G., Liverpool, Eng.
Corrigan, McKinney & Co., Cleveland, O.
Debevoise-Anderson Co., New York City.
Hanna & Co., M. A., Cleveland, O.
Hillman & Son, J. H., Pittsburg, Pa.
Lea, J. Tatnall, & Co., Philadelphia, Pa.
LaBelle Iron Works, Steubenville, O.
Lake Erie Ore Co., Cleveland, O.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Tod-Stambaugh Co., Cleveland, O.

ORE (Manganese).

Bond, Vivian, & Co., New York City.

OVENS.

Kenworthy Engineering Co., Waterbury, Conn.

OVENS (Core).

Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Smith Fdry. Supply Co., J. D., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

PACKING.

Jenkins Bros., New York City.
Watson-Stillman Co., New York City.

PATTERNS.

Birdsboro Steel Foundry & Machine Co., Birdsboro, Conn.
Cleveland Castings Pattern Co., Cleveland, O.
Freeman Pattern Works, Toledo, O.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Standard Pattern Works, Cleveland, O.
Walker Foundry Co., Erie, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Youngstown Foundry & Machine Co., Youngstown, O.

PATTERNS (Metal).

Canton Brass Co., Canton, O.

PENSTOCKS.

Petroleum Iron Works, Sharon, Pa.
Struthers-Wells Co., Warren, Pa.

PINIONS (Rawhide).

New Process Rawhide Co., Syracuse, N. Y.

PINS (Knuckle and Brake.)

Champion Rivet Co., Cleveland, O.

PINS (Pivot.)

Champion Rivet Co., Cleveland, O.

PIPE.

LaBelle Iron Works, Steubenville, O.
Lake Erie Boiler Works, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Mudge & Co., Edmund W., Pittsburg, Pa.
National Tube Co., Pittsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Rempe Co., Chicago, Ill.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Struthers-Wells Co., Warren, Pa.
United Cast Iron Pipe & Foundry Co., New York City.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE (Arch).

Parkesburg Iron Co., Parkesburg, Pa.

PIPE (Riveted Steel).

American Bridge Co., New York City.
Meehan Boiler & Construction Co., Lowellville, O.
Ohio Boiler Co., Girard, O.
Petroleum Iron Works Co., Sharon, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Standard Boiler & Plate Co., Niles, O.
Struthers-Wells Co., Warren, Pa.

PIPE (Wrought Iron).

Bourne-Fuller Co., Cleveland, O.
Pittsburg Piping Equipment Co., Pittsburg, Pa.

PIPING (Contractors).

Pittsburg Piping Equipment Co., Pittsburg, Pa.

PLANERS.

Cincinnati Iron Store Co., Cincinnati, O.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Punch & Shear Works, Cleveland, O.
Davis Mach. Co., W. P., Rochester, N. Y.
McCabe, J. J., New York City.
Motch & Merryweather Machy. Co., Cleveland, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Vandyck Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.

PLANTS (Galvanizing.)

Wilfong Bros., Philadelphia, Pa.

PLATE (Tin).

American Sheet & Tin Plate Co., Pittsburg, Pa.
Harvey Co., Arthur C., Boston, Mass.
Taylor Co., N. & G., Philadelphia, Pa.

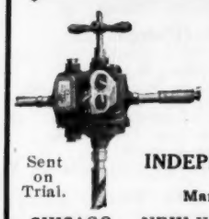
PLATES.

American Sheet & Tin Plate Co., Pittsburg, Pa.
Beals & Co., Buffalo, N. Y.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Cincinnati Iron Store Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Keystone Steel Co., Warren, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
Mudge, Edmund W., & Co., Pittsburg, Pa.
North Works, Illinois Steel Co., Chicago, Ill.
Otis Steel Co., Cleveland, O.
Petroleum Iron Works Co., Sharon, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Cincinnati, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.

Thor

PISTON AIR DRILLS

Standard of the World



Guaranteed to do 30% more work and to cost far less for maintenance than any other make.

Sent on Trial.

INDEPENDENT PNEUMATIC TOOL CO.

Manufacturers of Air Drills and Hammers

CHICAGO NEW YORK PITTSBURGH SAN FRANCISCO

"JUST AS GOOD"

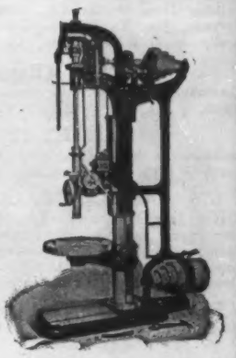
is the weak arguments of the others, but there is nothing just as good or nearly as good as

CINCINNATI

HEAVY PATTERN UPRIGHT DRILLING & TAPPING MACHINES

We claim superiority and originality in our design, material, workmanship, finish and most of all in results and what is more, WE PROVE IT.

New catalog tells it all and shows how Good Drills are made.



Cincinnati Machine Tool Co.

Western Ave. and Hulbert Place

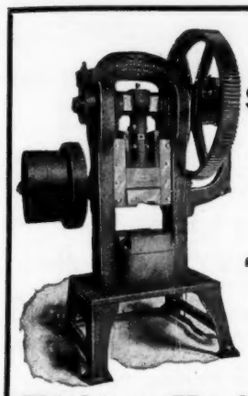
Cincinnati, Ohio, U. S. A.

The CELFOR DRILL

is twisted from a bar of high speed steel and the original fiber of the steel is not disturbed As a mechanic, you know what this means

This is why the Celfor Drill is tough instead of brittle, even though it is made of high speed steel.

CELFOR TOOL COMPANY, - CHICAGO, ILL.



"MICHIGAN"

Straight Side Presses

Designed for trimming drop forgings, punching, stamping and forming sheet metal.

Heavy Forged Steel Shafts
Extra Long Slides
Machine Cut Gears

"Michigan" Patented Automatic Jaw Clutch

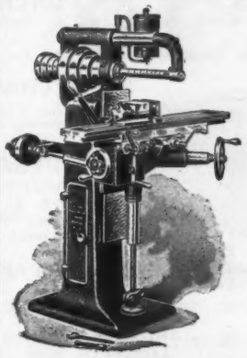
Workmanship and Material Guaranteed

Made in 6 sizes

SEND FOR CATALOG

Michigan Machinery Mfg. Co. Ypsilanti, Mich.

FOX LIGHT MILLING MACHINES



For the rapid and cheap production of extremely accurate work of small size. . . . .

Get posted. You can't afford not to.

FOX MACHINE CO.,

925-945 N. Front St.,

GRAND RAPIDS, MICH.

THE

"USE-EM-UP" DRILL SOCKET

is right and the price is right.

"Nuff said"

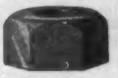
AMERICAN SPECIALTY CO.

1440 Monadnock Bldg. CHICAGO

NATIONAL BOLT & NUT CO.

Manufacturers of

HOT PRESSED **NUTS** COLD PUNCHED



Semi-Finished
Finished and Case Hardened

General Offices & Works:

62nd Street & A. V. R. R.
PITTSBURGH, PA

Machine Bolts
Carriage Bolts

Chicago Office, 417 Fisher Building.

Lag Screws,
Wrought Washers

THE CHAMPION RIVET COMPANY

CLEVELAND, OHIO

QUALITY GUARANTEED

LARGEST RIVET PLANT IN THE WORLD

BOILER, SHIP AND STRUCTURAL **RIVETS**

1-2 INCH AND LARGER

"VICTOR"

KNUCKLE AND BRAKE **PINS**

TO ANY SPECIFICATIONS

Hanna Engineering Works

850 Elston Ave.

CHICAGO

SEND FOR LITERATURE

RIVETERS
REAMERS
SHAKERS
RIDDLES
MOLD DRYERS
STOPING DRILLS

Black Diamond File Works

Twelve Medals Awarded for

"Very Superior Goods"

at International Exhibitions

Special Prize

GOLD MEDAL

at Atlanta, Ga., 1895

G. & H. BARNETT CO., **Philadelphia, Pa.**

PLATES (Boiler and Tank).
Globe Rolling Mill Co., Cincinnati, O.
LaBelle Iron Works Co., Steubenville, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

PLATES (Rapping).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

PLATES (Tie).
Lackawanna Steel Co., New York City.
North Works, Illinois Steel Co., Chicago, Ill.

PLUMBAGO.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.

POTS (Galvanizing and Tinning).
Meehan Boiler Construction Co., Lowellville, O.

PRESSES.
Beaudry & Co., Boston, Mass.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg.
Cleveland Punch & Shear Co., Cleveland, O.
Consolidated Press & Tool Co., Hastings, Mich.
Farrel Fdry. & Machine Co., Ansonia, Conn.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Michigan Machinery Mfg. Co., Ypsilanti, Mich.
Morgan Engineering Co., Alliance, O.
National Mach. Co., Tiffin, O.
Niles-Bement-Pond Co., New York City.
Toledo Machine & Tool Co., Toledo, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Watson-Stillman Co., New York City.
Williams, White & Co., Moline, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

PRESSES (Tuyere, Bessemer, Converter).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

PRODUCERS (Gas).
Duff Patents Co., Pittsburg, Pa.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Laughlin & Co., Alex., Pittsburg, Pa.
McClure, Son & Co., G. W., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
Petroleum Iron Works Co., Washington, Pa.
Smythe Co., S. R., Pittsburg, Pa.
Swindell & Bros., Wm., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wood & Co., R. D., Philadelphia, Pa.

PULLEYS.
Caldwell & Son Co., H. W., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Globe Rolling Mill Co., Cincinnati, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Palmer-Bee Co., Detroit, Mich.

PUMPS.
Cameron Steam Pump Works, New York City.
Chambersburg Engineering Co., Chambersburg, Pa.
Chicago House Wrecking Co., Chicago, Ill.
Dean Bros. Steam Pump Works, Indianapolis.
Deming Co., Salem, O.
Dravo, Doyle & Co., Pittsburg, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
McGowan, J. H., Co., Cincinnati, O.
Prescott, F. M., Steam Pump Co., Milwaukee, Wis.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Tod Co., Wm., Youngstown, O.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Watson-Stillman Co., New York City.
Wickes Bros., Pittsburg, Pa.

PUMPS (Boiler Feed).
Cameron Steam Pump Works, New York City.
Dean Bros. Steam Pump Works, Indianapolis.
Deming Co., Salem, O.
McGowan, J. H., Co., Cincinnati, O.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Prescott, F. M., Steam Pump Co., Milwaukee, Wis.

PUMPS (Steam).
Cameron Steam Pump Works, New York City.
Chambersburg Engineering Co., Chambersburg, Pa.
Dean Bros. Steam Pump Works, Indianapolis.
Deming Co., Salem, O.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Prescott, F. M., Steam Pump Co., Milwaukee, Wis.
Wood, R. D., & Co., Philadelphia, Pa.

PUMPS (Vacuum).
Bury Compressor Co., Erie, Pa.
Mesta Machine Co., Pittsburg, Pa.

PUNCHES AND SHEARS.
Allen, John F., New York City.
Alliance Machine Co., Alliance, O.
Beaudry & Co., Boston, Mass.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Chambersburg Engineering Co., Chambersburg.
Cincinnati Iron Store Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Consolidated Press & Tool Co., Hastings, Mich.
Hogg, George A., Iron & Steel Foundry Co., Pittsburg, Pa.
Long & Alstatter Co., Hamilton, O.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Marchant, George F., Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
National Machinery Co., Tiffin, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Toledo Tool & Machine Co., Toledo, O.
United Engineering & Foundry Co., Pittsburg.
Williams, White & Co., Moline, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

PUNCHES (Hand).
Bertsch & Co., Cambridge City, Ind.
Ryerson, Jos. T., & Son, Chicago, Ill.
Watson-Stillman Co., New York City.

PUNCHES (Pneumatic).
Allen, John F., New York City.
Hanna Engineering Works, Chicago, Ill.

PYROMETERS.
Bristol Co., Waterbury, Conn.
Brown, Edward, & Son, Philadelphia, Pa.
Stupakoff, S. H., Pittsburg, Pa.
Uehling Instrument Co., Passaic, N. J.

RAILS.
Atlas Car & Mfg. Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Globe Rolling Mill Co., Cincinnati, O.
Hathaway, A. G., & Co., Cleveland, O.
Lackawanna Steel Co., New York City.
North Works, Illinois Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.
Richardson & Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Wiener Co., Ernst, New York, N. Y.

RAMMERS (Bench).
Obermayer, S., Co., Cincinnati, O.

RAMMERS (Pneumatic-Foundry).
Cleveland Pneumatic Tool Co., Cleveland, O.

REAMERS (Radial).
Hanna Engineering Works, Chicago, Ill.

RECEIVERS (Air).
American Air Compressor Works, New York.
Bury Compressor Co., Erie, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Lake Erie Boiler Works, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Petroleum Iron Works Co., Washington, Pa.
Scaife & Sons Co., Wm. B., Pittsburg, Pa.

REGULATORS (Boiler Feed Water, Open Feed Water Heater and Pressure).
Chaplin-Fulton Mfg. Co., Pittsburg, Pa.
Squires Steam Specialties, Cleveland, O.
Strong, Carlisle & Hammond Co., Cleveland, O.

RHEOSTATS (Starting, Stopping and Field).
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

RIDDLES (Foundry).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

RIVETERS (Hydraulic).
Chambersburg Engineering Co., Chambersburg.
Mackintosh-Hemphill Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
Watson-Stillman Co., New York City.
Wood & Co., R. D., Philadelphia, Pa.

RIVETERS (Hydro-Pneumatic).
Hanna Engineering Works, Chicago, Ill.

RIVETERS (Pneumatic).
Allen, John F., New York City.
Bliss Co., E. W., Brooklyn, N. Y.
Cleveland Pneumatic Tool Co., Cleveland, O.
Hanna Engineering Works, Chicago, Ill.
Independent Pneumatic Tool Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

RIVETS (Structural, Boiler, Ship).
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bourne-Fuller Co., Cleveland, O.
Champion Rivet Co., Cleveland, O.
Cincinnati Iron Store Co., Cincinnati, O.
Globe Rolling Mill Co., Cincinnati, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Lockhart Iron & Steel Co., Pittsburg, Pa.
North Works, Illinois Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

RODS (Iron and Steel).
American Iron & Steel Mfg. Co., Lebanon, Pa.
Interstate Iron & Steel Co., Chicago, Ill.
North Works, Illinois Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

ROLLS (Bending and Straightening).
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
United Engineering & Foundry Co., Pittsburg.
Williams, White & Co., Moline, Ill.

ROLLS (Sand Chilled and Steel).
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Farrell Foundry & Machine Co., Ansonia, Conn.
Hogg Iron & Steel Foundry Co., Geo. A., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Seaman-Sleeth Co., Pittsburg, Pa.
United Engineering & Foundry Co., Pittsburg.
Tod Co., Wm., Youngstown, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Youngstown Foundry & Machine Co., Youngstown, O.

ROOFING (Corrugated).
Edwards Mfg. Co., Cincinnati, O.
Niles Iron & Steel Co., Niles, O.

ROOFING (Iron and Steel).
American Bridge Co., New York City.
American Sheet & Tin Plate Co., Pittsburg, Pa.
Edwards Mfg. Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Niles Iron & Steel Co., Niles, O.
Scaife Sons Co., Wm. B., Pittsburg, Pa.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.
Taylor, N. G., & Co., Pittsburg, Pa.

ROPE (Wire).
American Steel & Wire Co., Chicago, Ill.

RUNWAYS (Crane).
Cleveland Crane & Car Co., Wickliffe, O.
Scaife & Sons Co., Wm. B., Pittsburg, Pa.

SAFE ENDS.
Parkesburg Iron Co., Parkesburg, Pa.

SAND (Core).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

SAND (Molding).
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.

THE

Van Dorn & Dutton Co.

CLEVELAND, OHIO

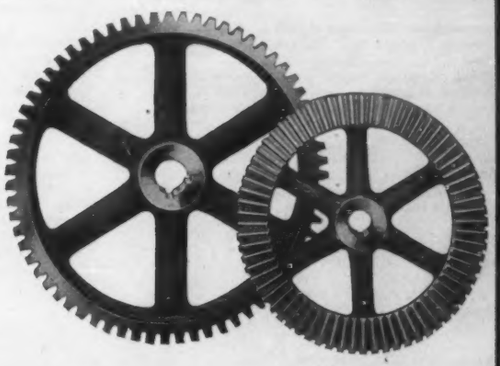
Manufacturers of

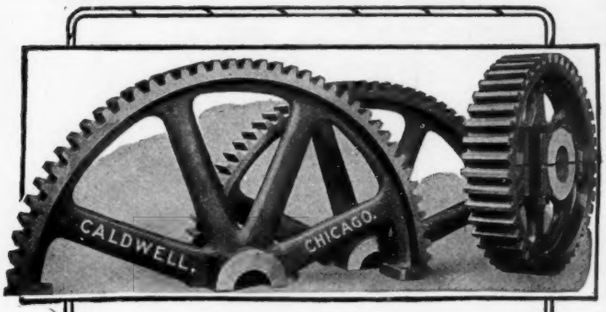
SPUR, BEVEL, MITRE, WORM, and SPIRAL GEARS

GEAR CUTTING our specialty.

Design perfect----Workmanship the best----Prices right.

Let us quote you on your requirements.





Good Gears

Symmetrical, rims true, teeth uniform in size and shape—and accurately spaced. Molded in the best of materials. These are the things that give Caldwell gears high efficiency and make them **wear.** They are durable and economical. Try them.

H.W. Caldwell & Son Co.

CHICAGO, 17th Street and Western Ave.

New York, Fulton Building, Hudson Terminal, 50 Church Street

Mechanically Perfect and of the Highest Grade.

Peerless Rawhide Pinions.

GEARS

We manufacture Metal Gears in any style or size to suit your needs—just as accurate, efficient and durable as mechanical skill has yet devised.

THE

Horsburgh & Scott Co.

5114 Hamilton Ave. N. E.

CLEVELAND, OHIO

Write for Blue Book on Gearing.

BEVEL GEARS

Cut Theoretically Correct

Special Facilities for Cutting Worm, Spiral and Internal Wheels.

HUGO BILGRAM

MACHINIST

1233 Spring Garden St., Philadelphia, Pa.

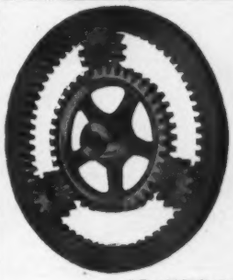
AUTOMATIC GEAR CUTTING MACHINES

OF ALL KINDS

Designed and Manufactured by

NEWARK GEAR CUTTING MACHINE CO.

66 Union St., Newark, N. J., U. S. A.



BIG LITTLE **GEARS** EXTERNAL INTERNAL

Spur		Bronze
Bevel		Brass
Mitre	OF	Steel
Worm		C Iron
Spiral		Raw Hide
Intermittent		Fibre

GRANT'S TREATISE ON GEARS, $1.00

New Modern Catalog—FREE

Address Dept. T.

PHILADELPHIA **GEAR** WORKS, INC.

Geo. B. Grant, Pres. and M. E. Philadelphia

SAWS (Cold Metal).
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Espen-Lucas Machine Works, Philadelphia, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Vandyck Churchill Co., New York City.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

SAWS (Hot).
Mesta Machine Co., Pittsburg, Pa.
United Engineering & Foundry Co., Pittsburg.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SCREWS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Chicago Screw Co., Chicago, Ill.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Upson Nut Co., Cleveland, O.

SEPARATORS (Magnetic).
General Electric Co., Schenectady, N. Y.
Paxson Co., J. W., Philadelphia, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

SEPARATORS (Steam or Oil).
Austin Separator Co., Detroit, Mich.
Dravo, Doyle & Co., Pittsburg, Pa.
Harrison Safety Boiler Works, Philadelphia, Pa.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Squires Steam Specialties, Cleveland, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

SHAFTING.
American Steel & Wire Co., Chicago, Ill.
Baird Machinery Co., Pittsburg, Pa.
Caldwell & Son, H. W., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Foundry & Machine Co., Ansonia, Conn.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., & Co., Boston, Mass.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Palmer-Bee Co., Detroit, Mich.
Pittsburg Shafting Co. of Detroit, Detroit.
Republic Iron & Steel Co., Pittsburg, Pa.
Wickes Bros., Pittsburg, Pa.

SHAFTS (Flexible).
Stow Mfg. Co., Binghamton, N. Y.

SHAPERS.
Baird Machinery Co., Pittsburg, Pa.
Cincinnati Shaper Co., Cincinnati, O.
McCabe, J. J., New York City.
Motch & Merryweather Machine Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Vandyck Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.

SHAPES (Agricultural).
Buffalo Steel Co., Tonawanda, N. Y.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.

SHEARS (Billet, Bloom and Slab).
Mesta Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS (Lever).
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS (Squaring).
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS (Vertical).
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEETS (Corrugated).
American Sheet & Tin Plate Co., Pittsburg, Pa.
Edwards Mfg. Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Kratzer, W. N., & Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Niles Iron & Steel Co., Niles, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Black Steel).
American Sheet & Tin Plate Co., Pittsburg, Pa.
Cincinnati Iron Store Co., Cincinnati, O.
Globe Rolling Mill Co., Cincinnati, O.
Niles Iron & Steel Co., Niles, O.

SHEETS (Galvanized).
American Sheet & Tin Plate Co., Pittsburg, Pa.
Cincinnati Iron Store Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., & Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Niles Iron & Steel Co., Niles, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Iron and Steel).
American Sheet & Tin Plate Co., Pittsburg, Pa.
Beals & Co., Buffalo, N. Y.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Edwards Mfg. Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
Jessop, William, & Sons, New York City.
Kratzer, W. N., & Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Niles Iron & Steel Co., Niles, O.
North Works, Illinois Steel Co., Chicago, Ill.
Petroleum Iron Works Co., Sharon, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHOVELS SPADES AND SCOOPS.
Avery Stamping Co., Cleveland, O.

SHOVELS (Steam).
Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Thew Automatic Shovel Co., Lorain, O.

SIFTERS (Sand).
Hanna Engineering Works, Chicago, Ill.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

SILICO-SPIEGEL.
Bond, Vivian, & Co., New York City.

SILICO-MANGANESE.
Bond, Vivian, & Co., New York City.

SLABS.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
United Steel Co., Canton, O.

SLABS (Sheet).
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPSTONE.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.

SPECIALTIES (Steam).
Cameron, A. S., Steam Pump Co., New York City.
Chaplin-Fulton Mfg. Co., Pittsburg, Pa.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Dravo, Doyle & Co., Pittsburg, Pa.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Harrison Safety Boiler Works, Philadelphia, Pa.
Jenkins Bros., New York City.
Knudsen-von Kothen Mfg. Co., Dolton, Ill.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Strong, Carlisle & Hammond, Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

SPELTER.
Grasselli Chemical Co., Cleveland, O.
Illinois Zinc Co., Peru, Ill.

SPIKES.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel & Wire Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville,, O.
Republic Iron & Steel Co., Pittsburg, Pa.

SPLICES (Rail).
Carnegie Steel Co., Pittsburg, Pa.
Central Track Supply Co., Springfield, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
North Works, Illinois Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.

SPRAYERS (Paint—Pneumatic).
Niagara Device Co., Buffalo, N. Y.

STACKS.
American Bridge Co., New York City.
Meehan Boiler & Construction Co., Lowellville, O.
Ohio Boiler Co., Girard, O.
Petroleum Iron Works Co., Sharon, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Standard Boiler & Plate Iron Co., Niles, O.
Struthers-Wells Co., Warren, Pa.

STAMPING (Sheet Metal).
Avery Stamping Co., Cleveland, O.

STAMPS (Steel Letter).
Cleveland Steel Stamp Works, Cleveland, O.

STAND-PIPES.
American Bridge Co., New York City.
Petroleum Iron Works Co., Sharon, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.

STAPLES.
Youngstown Sheet & Tube Co., Youngstown, O.

STEEL.
American Bridge Co., New York City.
Beals & Co., Buffalo, N. Y.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., & Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jessop, Wm., & Sons, Ltd., New York City.
Jones & Laughlin Steel Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Mudge, Edmund W., & Co., Pittsburg, Pa.
North Works, Illinois Steel Co., Chicago, Ill.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

STEEL (Structural).
American Bridge Co., New York City.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Carnegie Steel Co., Pittsburg, Pa.
Cincinnati Iron Store Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Interstate Engineering Co., Bedford, O.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
McClintic-Marshall Constr. Co., Pittsburg, Pa.
Mudge, Edmund W., & Co., Pittsburg, Pa.
North Works, Chicago, Ill.
Pittsburg Steel Construction Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Scully Steel & Iron Co., Chicago, Ill.

IF IT'S FOUNDRY EQUIPMENT THINK OF "WHITING"

WHITING FOUNDRY EQUIPMENT CO.

"WHITING" EQUIPMENT MEANS SATISFACTION

GENERAL OFFICE AND WORKS: HARVEY, ILL., U. S. A.
(CHICAGO SUBURB)
CHICAGO OFFICE: 1547 MARQUETTE BUILDING

AIR HOISTS
LADLES
TUMBLERS
TRUCKS
TURNTABLES
Send for Catalogs and Prices

ELECTRIC TRAVELERS

CRANES FOR EVERY SERVICE
Complete Equipment for Foundries

CUPOLAS
ELEVATORS
CORE OVENS
CORE CARS
SAND SIFTERS

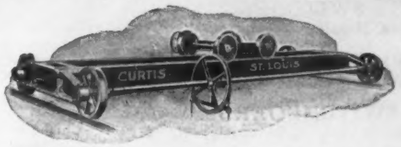
JEFFREY APRON CONVEYER

of Particularly Powerful Construction Handling bundles of Wire from cars to storage. Elevating Conveying.

Catalogues free.

THE JEFFREY MFG. CO., Columbus, Ohio, U. S. A.

CURTIS DOUBLE BEAM CRANES



Made up to 24,000 pounds capacity and 40 foot span.

Crane and Trolley Wheels large in diameter and bushed with roller bearings. All parts figured with large factor of safety.

Curtis Air Hoists; Curtis Automatic Belt Driven Compressors; Curtis Pneumatic Elevators; Curtis Roller Bearing Trolleys.

CURTIS & CO. MFG. CO., St. Louis, Mo.

Operators of St. Louis Steel Foundry
Agent—A. BALDINI & CO., Pontedera, Italy.
Mr. A. E. HOERMANN, M. E., Eastern Manager, 30 Church St., New York, N. Y

CONVEYORS
ELEVATORS
ORE and COAL HANDLING MACHINERY

Manufactured by

The C. O. Bartlett & Snow Co.

CLEVELAND, OHIO

To make our name fit our product

The name of the Company has been changed from

The General Pneumatic Tool Co.

to

SHEPARD ELECTRIC CRANE & HOIST COMPANY

OUR PRODUCT
Shepard Electric Cranes Shepard Electric Hoists
Shepard Pneumatic Hoists
Shepard Riveters Shepard Trolleys
Write for Bulletins.

SHEPARD ELECTRIC CRANE & HOIST CO.
General Offices and Works, Montour Falls, N. Y.
New York, Philadelphia, Pittsburg, San Francisco, Toronto, Montreal,

¶ The United States Navy has adopted the modern steel Boiler Tube. Steel Boiler Tubes have also withstood the actual test of severe service in many of the large railway systems of the country. Considerable information on the general subject of Boiler Tubes will be found in next week's issue of *The Iron Trade Review*.

NATIONAL TUBE COMPANY
Pittsburgh, Pa.

ORE JIGS
ORE WASHERS

With Patent Steel or Wood Logs, and all other Machinery necessary for outfit

Send for Catalogue

McLANAHAN-STONE MACHINE CO.
Hollidaysburg, Pa.

ALLIANCE CRANES All Types

Also Rolling Mill and Hydraulic Machinery, Steam Hammers, Punches and Shears, Scale Cars, Copper Converting Machinery, etc.

THE ALLIANCE MACHINE CO.
ALLIANCE, O.

Pittsburg Office, Frick Building
Birmingham Office, Woodward Building

STEEL (Tool).
Bourne-Fuller Co., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., Co., Boston, Mass.
Jessop, Wm., & Sons, New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

STOCKS (Die).
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Standard Engineering Works, Ellwood City, Pa.

STOKERS (Mechanical).
Green Engineering Co., Chicago, Ill.

STONES (Oil).
Carborundum Co., Niagara Falls, N. Y.
Cole, J. Wendell, Columbus, O.
Norton Co., Worcester, Mass.

STONES (Rubbing and Sharpening).
Carborundum Co., Niagara Falls, N. Y.
Cole, J. Wendell, Columbus, O.
Norton Co., Worcester, Mass.

STOOLS (Shop).
New Britain Mach. Co., New Britain, Conn.

SWITCHES.
Central Track Supply Co., Springfield, O.

SUPPLIES (Pattern Makers').
Cleveland Galvanizing Works Co., Cleveland, O.

SWITCHBOARDS.
General Electric Co., Schenectady, N. Y.

SWITCHES (Electrical).
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

SWITCHES (Magnetic).
Electric Controller & Mfg. Co., Cleveland, O.

TABLES (Drawing).
Economy Drawing Table Co., Toledo, O.

TABLES (Turn).
Atlas Car & Mfg. Co., Cleveland, O.
Chase Fdy. & Mfg. Co., Columbus, O.
Cleveland Crane & Car Co., Cleveland, O.
Interstate Engineering Co., Bedford, O.
Northern Engineering Works, Detroit, Mich.
Ryerson, Jos. T., & Son, Chicago, Ill.

TALC.
Obermayer, S., Co., Cincinnati, O.

TANKS AND TOWERS.
Kratzer, W. N., & Co., Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O.
Newbold, R. S., & Son, Norristown, Pa.
Ohio Boiler Co., Girard, O.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburg Steel Construction Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Standard Boiler & Plate Iron Co., Niles, O.
Struthers-Wells Co., Warren, Pa.

TOOLS (Molders').
Obermayer, S., Co., Cincinnati, O.

TOOLS (Pneumatic).
Bury Compressor Co., Erie, Pa.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Niagara Device Co., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

TOOLS (Thread Cutting).
Armstrong Bros. Tool Co., Chicago, Ill.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Stoever Fdy. & Mfg. Co., Myerstown, Pa.
Williams Tool Co., Erie, Pa.

TORCHES (Shop).
Dayton Malleable Iron Co., Dayton, O.

TRACK (Industrial).
Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Guerrlich, F. C., New York, N. Y.
New Jersey Fdy. & Mach. Co., New York City.
Central Track & Supply Co., Springfield, O.
Northern Engineering Works, Detroit, Mich.

TRACK (Overhead).
Brown Hoisting Machinery Co., Cleveland, O.
Guerrlich, F. C., New York, N. Y.
New Jersey Fdy. & Mach. Co., New York City.
Whiting Foundry Equipment Co., Harvey, Ill.

TRAMRAILS (Overhead Systems).
Brown Hoisting Machinery Co., Cleveland, O.
Northern Engineering Works, Detroit, Mich.

TRANSMISSION EQUIPMENT (Power).
Dodge Mfg. Co., Mishawaka, Ind.
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

TRANSMISSION EQUIPMENT (Rope).
Dodge Mfg. Co., Mishawaka, Ind.

TRAPS (Air).
Wright Mfg. Co., Detroit, Mich.

TRAPS (Steam).
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Harrison Safety Boiler Works, Philadelphia, Pa.
Jenkins Bros., New York City.
Squires Steam Specialties, Cleveland, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

TROLLEYS.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Crane & Car Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Morgan Engineering Co., Alliance, O.
New Jersey Fdy. & Mach. Co., New York City.
Pawling & Harnischfeger, Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS.
Jones & Laughlin Steel Co., Pittsburg, Pa.
New Britain Mach. Co., New Britain, Conn.
Wellman-Seaver-Morgan Co., Cleveland, O.
Youngstown Car Mfg. Co., Youngstown, O.

TRUCKS (Electrically Driven).
Westinghouse Machine Co., E. Pittsburg, Pa.

TRUCKS (Storage Battery).
Westinghouse Machine Co., E. Pittsburg, Pa.

TRUCKS (Wire and Nail Mill).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TUBES.
Bourne-Fuller Co., Cleveland, O.
Cincinnati Iron Store Co., Cincinnati, O.
Globe Rolling Mill Co., Cincinnati, O.
National Tube Co., Pittsburg, Pa.
Parkesburg Iron Co., Parkesburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Shelby Steel Tube Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBING (Automobile).
National Tube Co., Pittsburg, Pa.
Shelby Steel Tube Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

TURBINES (Steam).
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

TURNBUCKLES.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Anderson Forge & Mach. Co., Detroit, Mich.
Cleveland City Forge & Iron Co., Cleveland, O.
Columbus Forge & Iron Co., Columbus, O.
Globe Rolling Mill Co., Cincinnati, O.
Graham Nut Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Merrill Bros., Brooklyn, N. Y.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

VALVES.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Jenkins Bros., New York City.
Knudsen-von Kothen Mfg. Co., Dolton, Ill.
McGowan, John H., Co., Cincinnati, O.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Watson-Stillman Co., New York City.
Pittsburg Piping & Equipment Co., Pittsburg, Pa.
Powell, Wm., Co., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.

VALVES (Back Pressure and Check).
Jenkins Bros., New York City.
McGowan, John H., Co., Cincinnati, O.
Powell, Wm., Co., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Squires Steam Specialties, Cleveland, O.

VALVES (Gas and Air Reversing).
Morgan Construction Co., Worcester, Mass.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

VALVES AND FITTINGS (Hydraulic).
Chambersburg Engineering Co., Chambersburg, Pa.

VALVES (Lever and Throttle).
Jenkins Bros., New York City.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Powell, Wm., Co., Cincinnati, O.

VALVES (Reducing).
Jenkins Bros., New York City.
Strong, Carlisle & Hammond Co., Cleveland, O.
Watson-Stillman Co., New York City.

VALVES (Regrinding).
Powell, Wm., Co., Cincinnati, O.

VISES.
Merrill Bros., Brooklyn, N. Y.
Wyman & Gordon Co., Cleveland, O.

WASHERS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Graham Nut Co., Pittsburg, Pa.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

WATER SOFTENING PLANTS.
Dodge Mfg. Co., Mishawaka, Ind.
Harrison Safety Boiler Works, Philadelphia, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.

WELDERS (Arc).
Electric Controller & Mfg. Co., Cleveland, O.

WELDING (Electric).
Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welding Co., Toledo, O.

WELDERS (Tire and Axle).
Long & Allstatter Co., Hamilton, O.
Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welding Co., Toledo, O.

WELDERS (Electric).
Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welding Co., Toledo, O.

WHEELS (Alundum).
Norton Co., Worcester, Mass.

WHEELS (Grinding).
Abrasive Material Co., Philadelphia, Pa.
Carborundum Co., Niagara Falls, N. Y.
Cole, J. Wendell, Columbus, O.
Norton Co., Worcester, Mass.

WIRE.
American Steel & Wire Co., Chicago, Ill.
Pittsburg Steel Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Cable and Rope).
American Steel & Wire Co., Chicago, Ill.
Pittsburg Steel Co., Pittsburg, Pa.

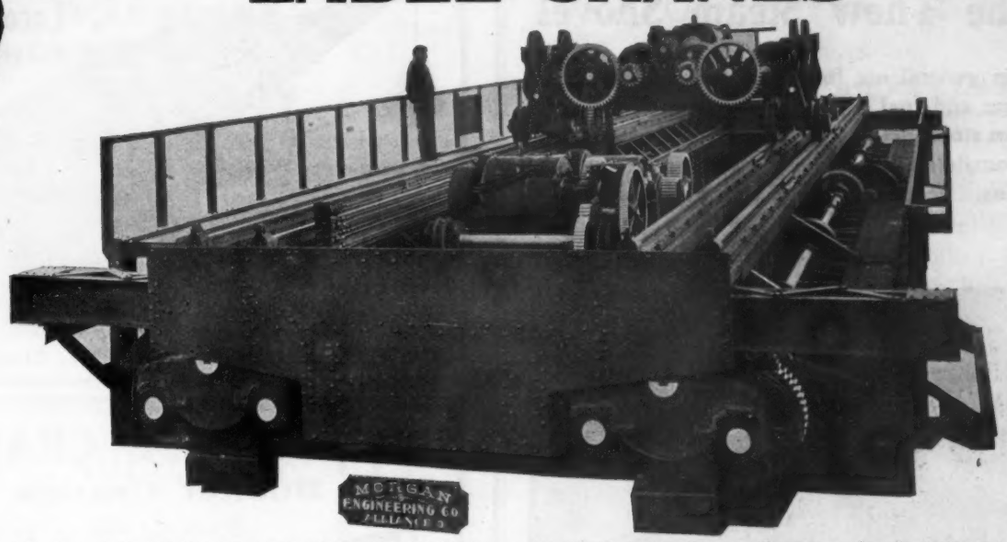
WIRE (Grilles).
American Steel & Wire Co., Chicago, Ill.
Globe Rolling Mill Co., Cincinnati, O.

WIRE AND CABLE (Insulated).
General Electric Co., Schenectady, N. Y.

WRENCHES.
Coes Wrench Co., Worcester, Mass.
Dayton Malleable Iron Co., Dayton, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.

ZINC.
Illinois Zinc Co., Peru, Ill.

LADLE CRANES



Our latest Design of Six-Girder Type Double Trolley Ladle Crane. No Overhanging Drum. Ropes passing down between two sections of main girder. Equalizing Trucks on Trolley and Bridge. All capped bearings. 4 Footways on Bridge.

ENGINEERS AND MANUFACTURERS
Pioneer Crane Builders. 3000 Cranes in successful operation.
Builders of Hammers, Shears and all kinds of heavy special machinery

CHICAGO, ILL. Railway Exchange
NEW YORK 165 Broadway
LONDON
PARIS

The MORGAN ENGINEERING COMPANY
ESTABLISHED 1868
Alliance, Ohio. U.S.A.

PITTSBURG, PA. Frick Building
BIRMINGHAM, ALA. Woodward Bldg.
BRUSSELS, BELGIUM
COPENHAGEN
TOKIO

NORTHERN HIGH GRADE CRANES.
NORTHERN ENGINEERING WORKS.
DETROIT, MICH. U.S.A.
All kinds of Cranes for all kinds of duty

NEW YORK, 120 Liberty St. PHILADELPHIA, Land Title Bldg. BUFFALO, Prudential Bldg. PITTSBURG, Machesney Bldg. CHICAGO, 539 Monadnock Blk. ST. LOUIS, 720 N. 2nd St.

TRAVELING
CRANES
All Types - Any Capacity
Electric or Hand Operating

ELECTRIC TRAVELING HOISTS
for I Beam Runways and Transfer Cranes

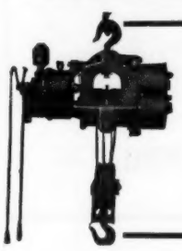
PAWLING & HARNISCHFEGER
MILWAUKEE, WIS.

DODGE
POWER TRANSMISSION
MACHINERY

embraces a high-grade line of Shaft Hangers and Bearings, Collars, Couplings, Wood and Iron Pulleys, Friction Clutches, etc. Also Rope Drives.

Dodge Designs and Plans for Shafting Equipments and Rope Drives are backed by twenty-five years' successful experience in this branch of engineering.

DODGE MANUFACTURING COMPANY
MISHAWAKA, INDIANA.



ONE TO TEN TONS

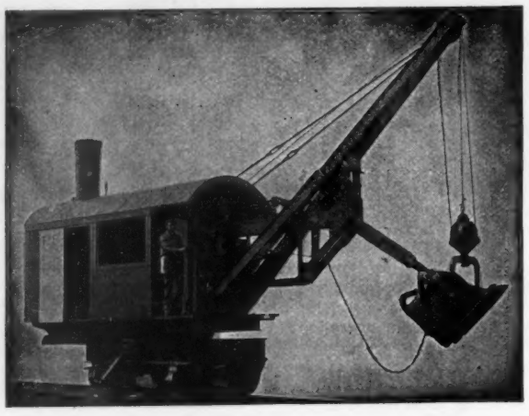
Geared PNEUMATIC Hoists
and other labor saving compressed air appliances.
Durability and efficiency guaranteed.
DETROIT HOIST & MACHINE CO.
Successors to PILLING AIR ENGINE CO.
Detroit, Mich.

ENGINES 2 to 20 H. P. for CRANES DERRICKS WINCHES ETC.

The Thew Steam Shovel

Is in general use for handling iron ore, limestone and fuel at the mines, upon docks and from stockpiles in furnace yards. Swings thro a complete circle. Can be used as a locomotive crane. Economical for moderate outputs.

Write for Catalogue.



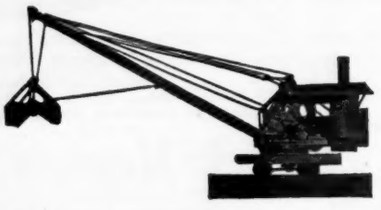
The Thew Automatic Shovel Co.
LORAIN, OHIO

OUR SPECIALTY
Locomotive Cranes
All Sizes

We also build
Car Dumpers
Fueling Plants
Clam Shell Buckets
Coal Handling Machinery

The McMYLER MFG COMPANY, Cleveland, O.

LOCOMOTIVE CRANES
Bucket Cranes



In Capacities from THREE to SIXTY TONS

INDUSTRIAL WORKS
Bay City, Mich.

The Bucyrus Company
SOUTH MILWAUKEE, WIS.
STEAM SHOVELS AND DREDGES
Placer Mining Machinery of the Elevator Bucket Type
Railroad Wrecking Cars and Pile Drivers
Centrifugal Dredging Pumps
New York Office: Hudson Terminal, Fulton Bldg., 50 Church St.

"NEVER-BREAK"

Thousands in Use

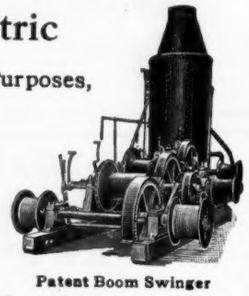
Hydraulic and Power pressed work of all kinds.
Steel Plates cut to special shape ¼" to 1" thick.
Send sketch.
We also make a full line of Wrought Steel Washers.
THE AVERY STAMPING CO.
CLEVELAND - - OHIO

FLORY HOISTING ENGINES
Steam and Electric

Adapted for all Hoisting Purposes, Contractors, Railroads, Mines and Quarries.

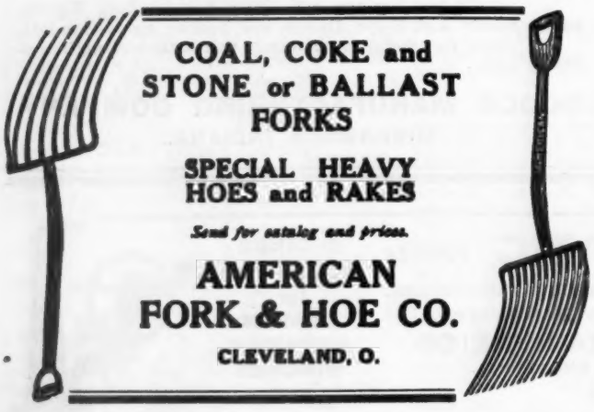
Dredging Engines and Cableways.

Our Guarantee 30 years experience



Patent Boom Swinger

S. FLORY MFG. CO., Bangor, Pa.



COAL, COKE and STONE or BALLAST FORKS

SPECIAL HEAVY HOES and RAKES

Send for catalog and prices.

AMERICAN FORK & HOE CO.
CLEVELAND, O.

Roller Bearing Cars and Trucks of all kinds for all purposes.
Switches, Turntables and complete Industrial Railway Equipments.

Write us for Catalog and Prices.

The Chase Foundry & Mfg. Co.
COLUMBUS, OHIO.

SOUTHWARK
FOUNDRY & MACHINE CO.,
Philadelphia, Pa.

OUR type of BLOWING ENGINES for Blast Furnaces and Bessemer Steel Works is largely used in the United States and Europe.

Built of vertical and horizontal pattern; simple and compound steam ends; and air cylinders fitted with our patented grid-iron valves which makes it possible to operate at higher speeds than with the usual form of air valve.

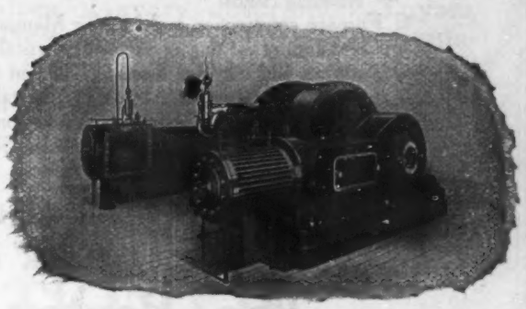
Catalogue upon application.

DRAVO, DOYLE & CO.
SALES AGENTS
PITTSBURG AND CLEVELAND.

Ball Automatic Engines,
Cochrane Feed Water Heaters,
Cochrane Steam and Oil Separators,
Sorge-Cochrane System of Water Purifying,
Robb-Mumford Internally Fired Boilers,
Union Iron Works Return Tubular Boilers,
Handy Traps,
Pumps for all Services.

R. D. WOOD & CO.
400 Chestnut St.
Philadelphia, Pa.

Guillotine Plate Shears, Forging Presses, Punches, Riveters and General Steel Working Tools. Accumulators, Pressure Pumps, Steam and Centrifugal Pumps. Gas Holders, Gas Power Plants with Producers.



THE BALL ENGINE CO.
Erie, Pa.

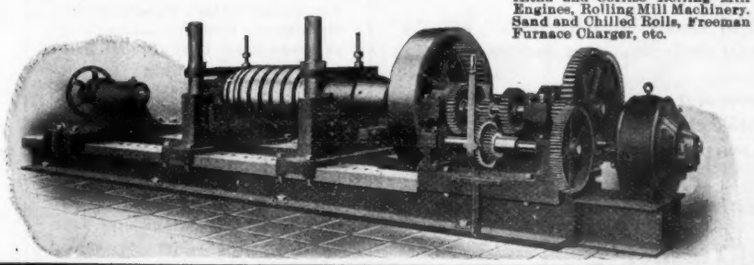
Wrought Iron Pipe Coils

FOR
Ice and Refrigerating Machines, Heaters, Soap Makers, Blast Furnaces, Coils of any shape or description in any desired continuous length.

REMPE CO.
Sacramento & Carrol Ave., CHICAGO, ILL.

The George A. Hogg Iron & Steel Foundry Co.
PITTSBURG, PA.

Ætna and Corliss Rolling Mill Engines, Rolling Mill Machinery. Sand and Chilled Rolls, Freeman Furnace Charger, etc.



NOW READY

The Latest and Most Important Contribution to Foundry Literature.

OPEN HEARTH STEEL CASTINGS

By W. M. CARR

FULLY ILLUSTRATED.

In this book are compiled the series of articles which appeared simultaneously in THE IRON TRADE REVIEW and THE FOUNDRY, on the manufacture of Open Hearth Steel Castings.

The following subjects are treated exhaustively---

¶ Selection and representative compositions of melting Stocks, Alloys, Refractories, Fuels and Molding Sands.
¶ Furnace construction and Melting Manipulation of Heats.
¶ Conditions of melting as affecting Physical Properties of Products.
¶ Analyses and Physical Tests of Different Grades of Products.
¶ Effect of Constituent Metals and Metalloids usually present in Open-Hearth Steel Castings.
¶ Heat Treatment of Castings with notes on Microscopic Examinations.
¶ Discussion of the Causes of Blow-holes, Shrinkage, Cracks, etc.
¶ Repairing Defects by Thermit Welding.

Price $1.50

BOOK DEPARTMENT

The Penton Publishing Co.

CLEVELAND

JUST OUT

NEW AND REVISED EDITION OF

The Metallurgy of Iron and Steel

By BRADLEY STOUGHTON, B. S., Ph. B.

Adjunct Professor of Metallurgy, School of Mines, Columbia University.

Prof. Stoughton's new book is designed both as a guide and reference work for men engaged in the manufacture of steel, and as a text book in colleges. It covers every phase of iron and steel processes, with a great number of well chosen and interesting illustrations.

In scope it is, therefore, very comprehensive, and yet avoids the excessive detail which makes so many works laborious and difficult, not only for reading but for reference.

It is easily and fully understood without the necessity of a previous knowledge of chemistry.

A chapter of the book gives the A, B, C of metallurgical chemistry, and the reading of this will make the book available for those who have had no previous training in this subject.

Furthermore, the comprehensive treatment of the subject will make the book of great value to civil, mechanical, electrical, chemical, structural and mining engineers, architects, inventors and others, where the main facts about iron and steel are required.

500 pages, 6 x 9, profusely illustrated. $3.00, postpaid.

THE CONTENTS IN BRIEF

Introduction—The Manufacture of Pig Iron—Purification of Pig Iron in General—Manufacture of Wrought Iron and Crucible Steel—The Bessemer Process—Open Hearth or Siemens-Martin Process—Defects in Ingots and Other Castings—Mechanical Treatment of Steel—Iron and Steel Founding—Solution Theory of Iron and Steel—Constitution of Steel—Constitution of Cast Iron—Malleable Cast Iron—Heat Treatment of Steel—Alloy Steels—Corrosion of Iron and Steel—Electro-Metallurgy of Iron and Steel—Metallography of Iron and Steel—Chemistry and Physics—Introductory to Metallurgy.

BOOK DEPARTMENT

THE PENTON PUBLISHING COMPANY

Cleveland, Ohio

If We Sell Valves To You Once We Know We Can Do It Again

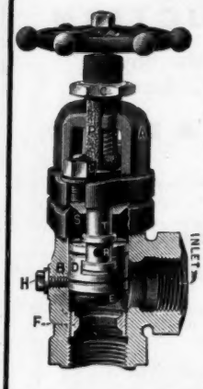
The explanation is simply this:—We know that the valves and pipage equipment we turn out stand at the most extreme top. We know that, if you are at the head of any great industrial plant, you would not be there unless you knew every detail that goes into the business. When we know this we know that once you've used our products your judgment would urge you to stay right in our line.

We manufacture valves of every description, Tuyers, Tuyer Cocks, Brass Unions, Steam Separators, Regulators, etc., etc. We also make Pipe Bends and do all kinds of Pipe Fitting, either assembled or erected.

Send for catalogue

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

Pittsburgh Cleveland New York Boston Birmingham, Ala.



POWELL "CYCLONE" BLOW-OFF VALVE

won't choke up with scale or sediment but closes down tight.

The plunger fits the body shell snug and is grooved to scrape off any particle of scale or sediment that might adhere to the sides of the body. The disc is of Powelium White Bronze—reversible, regrindable and renewable. The seat ring is of the best steam bronze, reversible, and the bevel face so constructed that sediment or scale can't lodge on it either while blowing off or in closing down.

Write to us for special circular or see it at your jobber.

DID YOU GET OUR CATALOG?

THE WM. POWELL CO.

Cincinnati, Ohio.

New York 254 Canal St. | Boston 239-45 Causeway St. | Philadelphia 518 Arch St.

PIPING ENGINEERS AND CONTRACTORS

PITTSBURG PIPING AND EQUIPMENT CO.

PITTSBURG, PA.

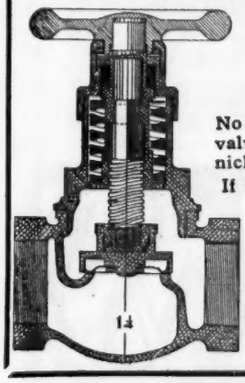
We furnish and erect **Complete Piping Systems** of all kinds.

Personal supervision of the erection of every contract entrusted to us insures not only the use of the best material but the correct installation of same.

"PEENED" JOINT "PITTSBURG" JOINT

Pittsburg Cleveland Philadelphia Chicago

SOMETHING NEW **A CAST IRON COIL SPRING**



for a THIS IS IT

PACKLESS VALVE

No corrosion inside of this valve: all springs are nickel-plated.

If you are interested in economy and cleanliness, write for our catalogue and price list.

The Knudsen-Von Kothen Mfg. Co.,

Delton, Cook Co., Ill. (Chicago Suburb.)

TRADE KvK MARK

Jenkins Bros. Valves

have the favor of engineers because they are the easiest to keep tight. Made of new steam metal of best quality. Interchangeable parts. Contain genuine Jenkins Discs--either *Hard*, for steam and hot water use; or *Soft*, for cold water, air or gas. *May we send you catalog?*

JENKINS BROS., New York, Boston, Philadelphia, Chicago.

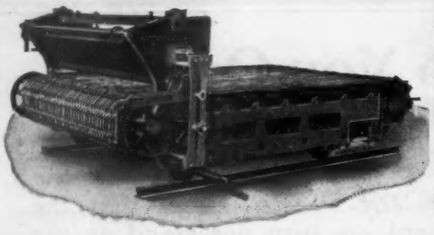
WATER PURIFICATION

Softening and Purifying Apparatus
We-Fu-Go and Scaife Systems

FILTERS AND FILTRATION PLANTS

Pressure and Gravity Types

Wm. B. Scaife & Sons Co., Pittsburgh, Pa.



Green Chain Grate Stokers

Highest Capacity

Automatic Labor-Saving | Smokeless Cheap Fuel | Highest Efficiency

Green Engineering Co.

Commercial National Bank Bldg., CHICAGO, ILL.
Farmers Bank Bldg., PITTSBURG, PA.
General Foundry Work a Specialty.

Morgan Construction Co.

Worcester, Mass.
52 Rue du Congres, Brussels, Belgium.

ROLLING MILL ENGINEERING

Continuous Rolling Mills

for the economical production of
SMALL BILLETS, BARS, RODS
HOOPS AND COTTON TIES.

Continuous Gas Producers
Continuous Heating Furnaces
Gear Planing
Bevel, Spur and Spiral Gears.
Wire Mill Machinery

CHICAGO NEW YORK

THE INTERSTATE ENGINEERING CO.

CLEVELAND, OHIO.

WORKS AT BEDFORD, O. KALTENBACH AND GRIESS. ENGINEERS

STEEL BUILDING AND BRIDGE CONSTRUCTION
TURNTABLES, LOCOMOTIVE CRANES, COAL AND ORE HANDLING PLANTS,
HOISTING AND CONVEYING MACHINERY.

WM. SWINDELL & BROTHERS
ENGINEERS AND CONTRACTORS

Open Hearth and Crucible Steel Plants. Swindell Recuperative System for Heating and Annealing. Water Seal Gas Producers, 1400 in operation. Regenerative Heating Furnaces. Malleable and Foundry Melting Furnaces, Gas Furnace Valves, 21 in. to 36 in. Diameter.

We Build Furnace Plants of Every Description.

German National Bank Building PITTSBURG, PA.

MACHINE SHOPS

Constructed of Wood, Steel, Brick or Concrete. Send us your plans. Our facilities for rapid erection are unexcelled.

PITTSBURG CONSTRUCTION CO.
207 Bissell Block, PITTSBURG.

STEEL CONSTRUCTION

For Mills, Factories, Train Sheds
Machine Shops, Bridges, Viaducts, &c.

The Bellefontaine Bridge & Steel Co.
BELLEFONTAINE, O.

G. W. McCLURE, SON & CO.
Engineers and Contractors
Bessemer Building PITTSBURG

Sole representatives THE McCLURE (*Massicks & Crooke*) Patent THREE PASS Fire-Brick Hot Blast Stoves. Two Pass Fire-Brick Hot Blast Stoves with Center Combination Chamber.

Open-Hearth Furnaces, Heating Furnaces, Soaking Pits.

All Kinds of Brick Work.

JOHN W. SEAVER
Consulting and Contracting Engineer

Manufacturing, Mining, and Contractors' Plants designed and superintended.

Special Steel Works, Coke Oven, and Material Handling Machinery designed and built.

Cable address REVAES. Cleveland, Ohio, U. S. A.

ALEX LAUGHLIN & CO.

Engineers and Contractors

700-706 LEWIS BLOCK PITTSBURG, PA.

THE S. R. SMYTHE COMPANY
Engineers and Contractors

Steel Works, Rolling Mills, Blast Furnaces, Hot Blast Stoves, etc

FURNACES FOR ALL REQUIREMENTS
GAS PRODUCERS for Fuel and Power, applied for all purposes

Established 1878 House Bldg. PITTSBURG, PA.

THE WELLMAN SEAVER MORGAN CO.

ENGINEERS AND MANUFACTURERS

GENERAL OFFICES CLEVELAND, OHIO.

STEEL WORKS AND ROLLING MILL MACHINERY
ORE AND COAL HANDLING MACHINERY

WORKS CLEVELAND & AKRON

Blast Furnace, Steel Works
Rolling Mill
Engineers

The Garrett-Cromwell Engineering Co.
New England Building, Cleveland, O.

Sole agents for continuous Open-Hearth
TALBOT
PROCESS

5,000 in successful operation
STEAM JET BLOWERS
for
GAS PRODUCERS
Write for Red Catalogue.
THE EYNON-EVANS MANUFACTURING CO.
Philadelphia, Pa.

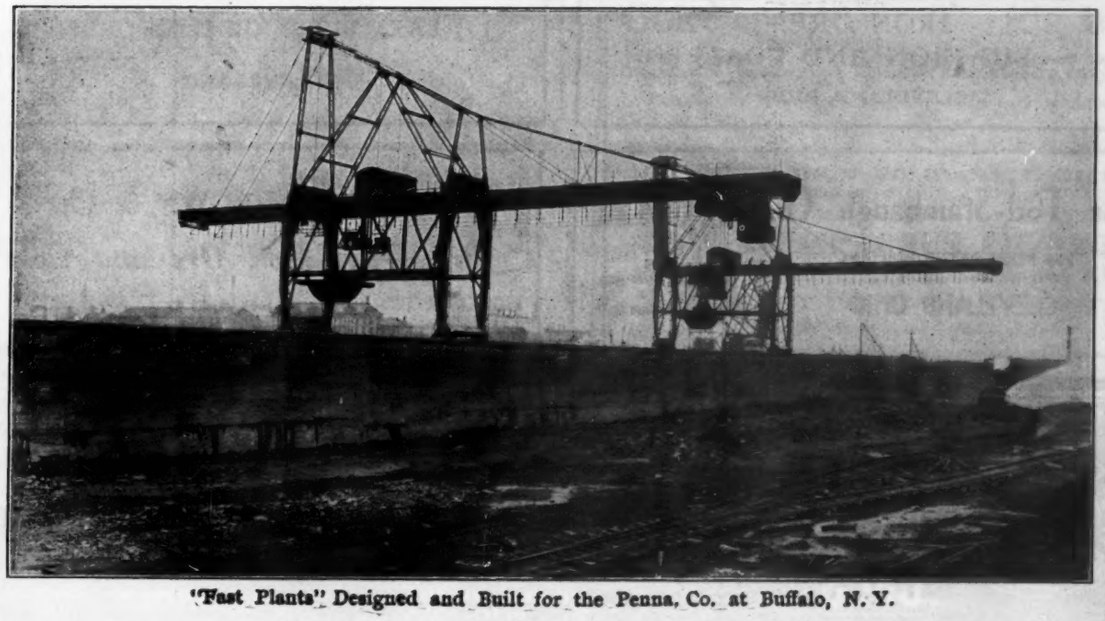
D. LAMOND & SON
Contracting Engineers
BLAST FURNACE CONSTRUCTION
Ferguson Block, Pittsburg, Pa.
Agents for C. H. Foote patent 2 and 4 pass Fire Brick Stove.

WALTER KENNEDY
Contracting and Consulting Engineer
Bessemer Building, PITTSBURG, PA.

JULIAN KENNEDY
Engineer
PITTSBURG, PA., U. S. A.
Cable Address: ENGINEER, Pittsburg.

LADD & BAKER
Consulting Engineers
REAL ESTATE TRUST BUILDING
S. E. Cor. Broad and Chestnut Sts.
PHILADELPHIA, PA., U. S. A.

ARTHUR G. McKEE,
CONSULTING AND CONTRACTING ENGINEER,
Rockefeller Building, CLEVELAND, OHIO.



"Fast Plants" Designed and Built for the Penna. Co. at Buffalo, N. Y.

THE BROWN HOISTING MACHINERY CO.
Engineers, Designers and Manufacturers of all kinds of Hoisting Machinery.
CLEVELAND, OHIO
Branch Offices: NEW YORK and PITTSBURG

METALS---ORES

11% and 50% Ferro-Silicon
80% Ferro-Manganese
Silico-Manganese
Silico-Spiegel, etc.

VIVIAN BOND & CO.
68 Beaver St., New York City
Frick Building Annex, Pittsburg, Pa.

F. A. EMMERTON
Chemist, Assayer and Metallurgist
Ores sampled at lake ports, mines and furnaces. Mines and Metallurgical Processes Examined. Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.
9 Bratenahl Building CLEVELAND, O.

CHEMICAL LABOFATORIES
Analysis of Ores, Iron, Steel, Oils Water, etc., etc.
PHYSICAL LABORATORIES
Tests of Metals, Drop and Pulling Test of Couplers, Draw Bars, etc.
ROBERT W. HUNT & COMPANY, ENGINEERS
Bureau of Inspection, Tests and Consultation
90 West St., New York; 1121 The Rookery, Chicago; Monongahela Bank Bldg., Pittsburg; 31 Norfolk House, London, Eng.; 425 Washington St., San Francisco; Canadian Express Bldg., Montreal, Can.; 1445 Syndicate Trust Bldg., St. Louis.
Inspection of Rails and Fastenings, Cars, Locomotives, Pipe, Etc. Bridges, buildings and other structures. Efficiency tests of boilers, engines, and locomotives. Reports and estimates on properties and processes.

THE LAKE ERIE ORE COMPANY
IRON ORE
Rockefeller Bldg. CLEVELAND, OHIO

L. & R. WISTER & CO.
Philadelphia Pittsburgh
Sales Agents for DUNBAR FURNACE COMPANY: Foundry, Forge and Basic Pig Iron. SEMET-SOLVAY and BEEHIVE COKE. DUNBAR Silica Rock Sand 99 per cent pure. NATIONAL GLASS BRICK Co. Opalescent and Colored Glass Brick

PIG IRON
and
Ferro Phosphorus
Hickman, Williams & Company
Chicago, Louisville, Cincinnati, St. Louis, Pittsburg.

IRON ORE. PIG IRON
Corrigan, McKinney & Co.
CLEVELAND, O.

Pickands, Mather & Co.
IRON ORE
PIG IRON AND COAL
CLEVELAND, OHIO

OGLEBAY, NORTON & CO.
LAKE SUPERIOR IRON ORES
CLEVELAND

The Tod-Stambaugh Co. **IRON ORES**
206 PERRY-PAYNE BUILDING
CLEVELAND, OHIO

PICKANDS, BROWN & CO.
Pig Iron, Iron Ore and Coke
CHICAGO

TRADE MARK.
LION BRAND ALLOYS & METALS
FERRO ALLOYS, METALS AND ORES
GEO. G. BLACKWELL, SONS & CO., Limited,
THE ALBANY, LIVERPOOL, ENG.
Manufacturers, Metallurgists, Mine Owners, Merchants.
WORKS: Garston Docks. CODES: A. B. C., Moreing & Neal, Lieber's, and Western Union.
Agents in the U. S. for our FLUOR SPAR: The Pennsylvania Salt Mfg. Co., Pittsburgh, Pa.

FOUNDED 1869 BY GEO. G. BLACKWELL
CHROME ORE. Blackwell's special Refractory quality for Furnace Linings.
MANGANESE ORE of every grade.
FLUOR SPAR. We are the largest mine owners in the world.
S. A. M. ALLOY. Produces sound ingots and blowhole-free castings.
FERRO PHOSPHORUS. CARBONLESS CHROMIUM METAL.
FERRO-MOLYBDENUM. Pure Molybdenum. MOLYBDENITE.
FERRO-CHROME. 60-72% Cr., [illegible] to 1% Carbon and any [illegible] up to 10%.
FERRO-TUNGSTEN 50-90%, TUNGSTEN METAL, 96-99%.
FERRO-TITANIUM, FERRO-BORON, FERRO-VANADIUM, 25% and 50%.
FERRO-SILICON, 25%, 50% and 75%. COPPER SILICON.
PLUMBAGO, BLACKLEAD, METAL WORKERS' CRAYONS.
We make and sell EVERY ALLOY AND METAL REQUIRED.
We make a SPECIAL HIGH SPEED ALLOY FOR TOOL STEEL.

Mighty Good
CONNELLSVILLE COKE
Jamison Selected, 72 Hour

Time was, and not long ago, when the Connellsville coke manufacturer willing to guarantee the sulphur in his product not to exceed 1% was a rare proposition. We concluded, and experience has justified the faith that was in us, that the foundryman who demands a guarantee as to the maximum sulphur in his coke is not a "crank," but is merely trying to avoid trouble, and to get what he is entitled to.

Jamison Coke, on a fair, comprehensive sample, will not exceed 12% in ash and 1% in sulphur. We make that guarantee and stand back of it. From the manner our people at the works are "setting to the saw" on quality, we are not sure but we shall go farther on this question of guarantee.

If you are willing to be shown, and appreciate a uniform foundry coke, a coke that will average about the same all the time in ash and sulphur and in careful loading, coupled with prompt shipments and fair dealing generally, please send us your inquiries, or call upon our Agents.

We ship no Coke except from our own Ovens.

JAMISON COAL & COKE CO., Pittsburgh, Pa.

Bessemer Coke Company

Offices: Lewis Block PITTSBURG, PA.

Manufacturers of

CONNELLSVILLE COKE

Furnace, Foundry and Crushed Coke

CAPACITY, 100 CARS DAILY

INDIVIDUAL CARS

Mines and Ovens in Connellsville region.

Direct connections with all the railroads entering the region.

Lake Superior Charcoal Pig Iron

BRANDS

PIONEER, ANTRIM, ELK RAPIDS, CHAMPION, MARQUETTE, MICHIGAN, EXCELSIOR, PINE LAKE.

Particularly adapted for the manufacture of Car Wheels, Cylinders, Malleables and all foundry Castings, where great strength is required.

SUPERIOR CHARCOAL IRON CO.

Grand Rapids, Mich.

McKeefrey & Co.

PIG IRON, COAL & COKE

Leetonia, Ohio

REED F. BLAIR & CO.

FRICK BUILDING, PITTSBURG, PA.

Coke — Strictly Standard Connellsville Foundry

Pig Iron — Low Phosphorus, Standard Bessemer, Malleable, Basic, Foundry, Gray Forge

Chrome Ore, Ferro-Manganese, Ferro-Silicon, Silicon-Spiegel.

WALTER-WALLINGFORD & CO.

PIG IRON & COKE

CINCINNATI PITTSBURGH

STEWART IRON COMPANY, LIMITED

Perry Payne Bldg., CLEVELAND, OHIO.

Manufacturers of

LOW PHOSPHORUS PIG IRON

Stand. Bess. Pig Iron Low Phos. Melting Bars Coke

STEWART PORTLAND CEMENT

Works at Sharon, Pa.

A B C OF IRON

By CHAS. W. SISSON.

118 Pages. *Price $1.00.*

A general description of Cast Iron and the elements contained in same. It describes blast furnace production and the various processes for making Steel. This book also contains considerable statistical information of general utility.

Book Department

THE PENTON PUBLISHING COMPANY

Cleveland, O.

Happy New Year

¶ Sounds great, doesn't it? And better than that, it means something. It sounds happy and looks happy to you and to me.

¶ One year ago things looked pretty blue; it took some nerve to look a fellow in the face, smile and hand out a cheery greeting. But most of us did it. Most of us hung on. I believe that little spark of optimism in most of us was worth more during the last twelve months than we will ever know.

¶ Now we are all together "right on the job," all looking forward confidently into a "Happy New Year."

¶ I hope it may be full of success and satisfaction for every one of my friends.

¶ I hope to be a part in their new year's business as far as lies in my power---and so being I shall consider myself with satisfaction a success.

¶ All that I can say or do to help things with you is yours, as you ought to know by this time.

¶ Let's get a little closer together during the new year and see if we can't make things hum. Best wishes

THE SALESMAN.

Rogers, Brown & Company

New York
Cincinnati
Chicago
Buffalo
Philadelphia

PIG IRON AND COKE
FERRO-MANGANESE—FERRO-SILICON
We represent 50 brands of PIG IRON produced in thirteen different states.
Also
30 brands of 72-hour foundry and furnace COKE, Connellsville, Virginia, Pocahontas, New River, West Virginia, Tennessee and Kentucky Districts.

Boston
St. Louis
Cleveland
Pittsburg
Birmingham

ALL KINDS AND GRADES
Imported and Domestic
FERRO-SILICON AND FERRO-MANGANESE

TENNESSEE COAL, IRON & RAILROAD COMPANY

PIG IRON
FOUNDRY—FORGE—BASIC
"DeBardeleben," "Eureka," "South Pittsburg," "Ensley," "Alice."

OPEN HEARTH STEEL
Rails, Blooms, Billets, Slabs, Bars
Sheared Plates, Angles

COAL
Steam—Gas—Blacksmith
Domestic

COKE
Furnace—Foundry
Domestic

GENERAL OFFICES:
Woodward Building, Birmingham, Alabama

DISTRICT SALES OFFICES:
New York, Philadelphia, Chicago, San Francisco, St. Paul, St. Louis, Boston, Denver, Cincinnati, Buffalo, New Orleans, Pittsburg, Detroit, Cleveland, Portland

Detroit Iron & Steel Co., Detroit, Mich.

At Detroit

We make Zug Foundry and Special Foundry, also Malleable Iron.

Inquiries Solicited.

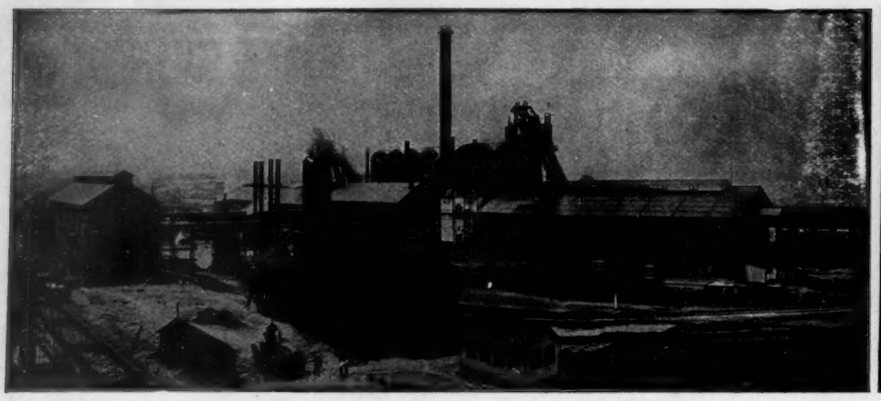
M. A. HANNA & CO.
AGENTS
CLEVELAND.

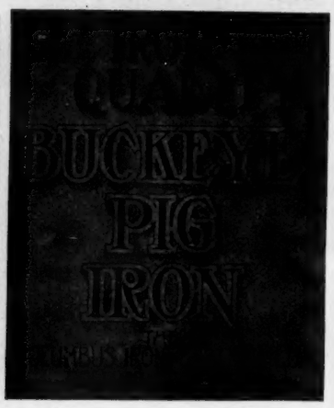
The Shenango Furnace Company

Frick Building, Pittsburg.

Pig Iron, Ores, Coke

Furnaces at Sharpsville, Pa. Coke Ovens: Westmoreland Co., Pa.
Iron Ore Mines: Lake Superior District.





Inspected Foundry Irons

You rarely find
so successful
a pair

Hector & Clinton

Soft
Strong
Uniform
and Fluid

Clinton Iron & Steel Co.

Gen'l Offices and Furnaces
PITTSBURG, PA.

24 Broad St.
NEW YORK

The THOMAS FURNACE CO.
Milwaukee, Wis.
Makers of FOUNDRY PIG IRON

DE CAMP BROS. & YULE
IRON, COAL AND COKE CO.
St. Louis - - Chicago
PIG IRON COKE SMITHING COAL FERRO-MANGANESE, ETC.
Exclusive Agents for Leading Brands **IRON**

EATON, RHODES & CO.
Pig Iron--Coke
First National Building,
CINCINNATI, O.

Mitchell-Diggins Iron Co.
Charcoal Pig Iron
Cadillac, Mich.

Robesonia Low Phosphorus Pig Iron
J. TATNALL LEA & CO., *Sole Agents,*
STEPHEN GIRARD BUILDING
19 South 12th St. Philadelphia

THE "CLEARFIELD" FIRE BRICK
MANUFACTURED BY
THE CLEARFIELD FIRE BRICK CO.
Office and Works at - - CLEARFIELD, PA.

FAIRVIEW FLUOR-SPAR & LEAD CO.
Mines: Fairview Landing, Illinois. **Sales Office: 38 Park Row, New York City.**

It is no longer necessary to use inferior Fluor-Spar. Having now an annual capacity of 50,000 tons we are prepared to furnish promptly

GRAVEL—For Steel Mills, running 90% and up C-F and not over 4% Silica.
LUMP—For Foundry use, running 94% and up C-F and less than 3% Silica.
GROUND—For Manufacturers of Hydro Fluoric Acid—Glass and Enamel Ware manufacturers, running 99% and up C-F and not over 0.50% Silica.

Prices are right. Let us send our Sales Manager to you. We want your contract.

Address: JOHN MULHOLLAND, President, 38 Park Row, New York City

BICKFORD FIRE BRICK COMPANY
CRESCENT FIRE BRICK

We manufacture exclusively hand made, high grade fire brick for

Blast Furnaces and Hot Blast Stoves, Open Hearth, Heating and Puddling Furnaces, Malleable Iron Plants, Glass Works, Cupolas, Rotary Cement Kilns and all high grade uses.

1122 FARMERS BANK BUILDING, PITTSBURG, PA.

Telephones: Bell, Grant 3144. P. & A., Main 194.

WORKS AT CURWENSVILLE, CLEARFIELD CO., PA.

(Formerly controlled by Reese-Hammond Fire Brick Co.)

THE STOWE-FULLER COMPANY, Cleveland, O.

FIRE BRICK
"Quality, Not Quantity."

We manufacture at our own Plants the highest quality of Magnesite, Chrome, Silica, and Fire Clay Brick with personal attention of interested and expert managers. Our brands are the Highest Quality made and we would be pleased to prove this to you in actual work, as we have with others.

Six Modern Plants, - - - - - - - 200,000 Daily Capacity.

Located in Pennsylvania, Ohio, and Kentucky. The only company furnishing all grades of furnace material from their own plants.

The highest grade refractories of all kinds.

Blast Furnace Lining that stands the wear with Skip Hoists or Hand-Filled Furnaces.

Pittsburg Office 711 House Bldg.

Ashland Fire Brick Co.

Ashland, Ky.

FIRE BRICK

For all purposes

Five Large Plants

Established 1864

CAPITAL STOCK

$100,000.00

HIGH GRADE FIRE BRICK

THE SCIOTO FIRE BRICK COMPANY

Sciotoville, - Ohio

AMERICAN REFRACTORIES COMPANY

Commercial National Bank Building, CHICAGO, ILL.

Silica, Magnesia, Chrome and Fire Clay Brick
Magnesite, Chrome Ore and Fire Clay.

Sole Agents
AUSTRO-AMERICAN MAGNESITE CO., of Austria.

General Western Agents
ASHLAND FIRE BRICK COMPANY

The Oak Hill Fire Brick & Coal Co.

OAK HILL, OHIO

Manufacturers of the celebrated

O. K. Crown, O. K. and A. brands of Fire Brick.

Close attention given to special shapes and sizes. Prompt service and good workmanship guaranteed. We solicit correspondence. Catalog and samples on application.

DOVER FIREBRICK CO.

MANUFACTURERS OF
Highest Grade Pennsylvania and Ohio
FIRE BRICK
"NORTH BEND" "DOVER" "BUCKEYE"
General Office 509 Cuyahoga Bldg., Cleveland, Ohio.

Pittsburgh Office 610 Fitzsimons Bldg., 331 Fourth Ave. Telephone No. 1101 Court

THE OHIO FIRE BRICK CO.

OAK HILL, OHIO

FIRE BRICK

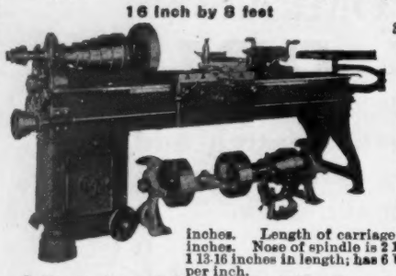
JOS. SOISSON FIRE BRICK CO.

Manufacturers of High Grade Fire and Silica Brick for all purposes. Coke Oven Brick a specialty.

Main Office, Connellsville, Pa.

"G.M." SOREW CUTTING ENGINE LATHE

16 inch by 8 feet



DIMENSIONS

Swings over shears 16 1-4 inches. Swings over carriage 10 1-4 inches. Takes between centers 4 feet 10 1-2 inches. Diameter of hole through spindle 1 5-16 inches. Size of front bearing of spindle 2 9-16 inches diameter by 4 1-2 inches long. Size of rear bearing of spindle 2 3-16 inches diameter by 3 inches long. Traverse of compound rest 4 3-4 inches. Length of carriage bearing on shears 23 inches. Nose of spindle is 2 1-4 inches in diameter, 1 13-16 inches in length; has 6 U. S. Standard threads per inch.

Lathe complete with Large and Small Face Plates, Compound Rest, Steady Rest, Power Cross Feed Change Gears. Splined Screw with interlocking device for belt or gear drive. Wrenches, Large Cabinet Leg and Friction Countershaft. Weight 1,750 lbs.

Manufactured by

The G. M. Lathe Company, Lennox Bldg. CLEVELAND, O.

FACTORY SITES

ARE OFFERED

MANUFACTURERS

WITH

Satisfactory Inducements, Favorable Freight Rates, Good Labor Conditions, Healthful Communities

on the lines of

THE ILLINOIS CENTRAL R. R.

For full information and descriptive pamphlet address

J. C. CLAIR,
INDUSTRIAL COMMISSIONER
Park Row, CHICAGO, ILL.

¶ THE ACTUAL TEST OF SERVICE has demonstrated that the modern steel Boiler Tube has satisfactorily fulfilled the service required of a Boiler Tube. Considerable valuable information will be found in this connection in next week's issue of *The Iron Trade Review*.

NATIONAL TUBE COMPANY
Pittsburgh, Pa.

FOR SALE

1—2½" Acme Upsetting and Forging Machine.
1—2" Ajax Upsetting and Forging Machine.
1—No. 5 Williams-White Bulldozer.
1—R. S. Newbold Rotary Shear, 24" throat, capacity 1-2" plate.
1—Double crank geared power press, 43" between housings, total weight 24,000 lbs. New, prompt delivery.
1—Norwalk Compound air compressor, 900' free air per minute. Excellent condition.
1—Rarig Air Compressor, 700 cu. ft. per minute. Good condition.
1—10-ton Locomotive crane.
1—McMyler locomotive crane or whirler, 13' 6" gauge, 55' boom, 40 H. P. boiler, 8 x 10 double drum engine, self propelling, equipped for handling clam shell bucket.

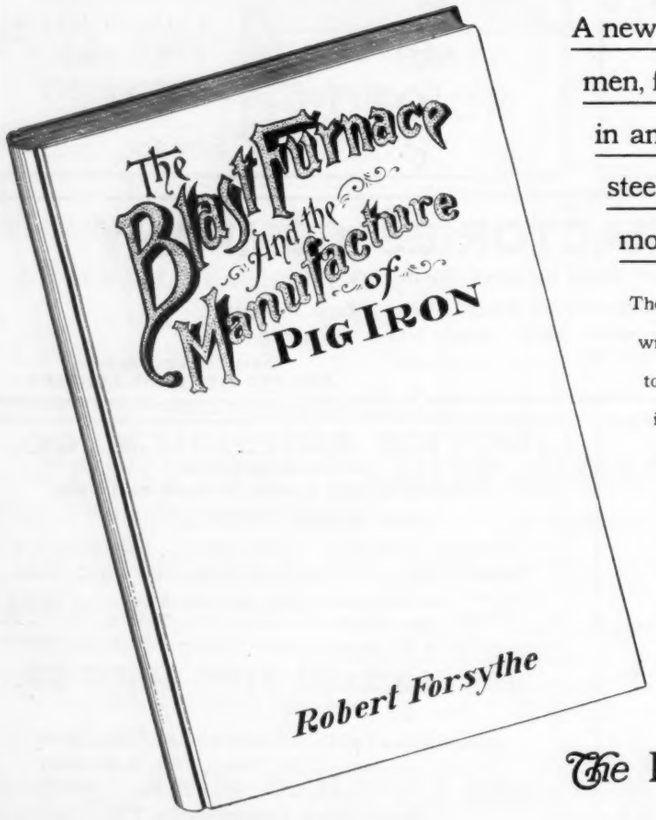
W. R. BEATTY MACHINERY & EQUIPMENT CO.
House Building
Pittsburg, Pa. P

NOTICE

Machinery Dealers—Concerns Supplying Building Contractors.

Kindly write us for our Agency Plan to handle and represent our lines of Concrete Mixers and Cement Brick Machines.

SOUTH BEND MACHINE MFG. CO.
108 LaSalle St., CHICAGO. U. S. A. P



A new book for ambitious operators, salesmen, foremen or other employes or officials in any way connected with the iron and steel business and desirous of knowing more about it.

The author in compiling this book has felt that recent writers on iron metallurgy have addressed themselves too exclusively to those who are already well versed in its mysteries, and it has generally been impossible for ambitious workmen to secure something on this subject of a sufficiently simple and concise nature. Mr. Forsythe's book, however, supplies this long felt want.

Price $3.00, carriage prepaid

Address Book Department

The Penton Publishing Co.
CLEVELAND, OHIO

SECOND-HAND "HIGH GRADE" MACHINERY

BORING MACHINES

(1) 2B Binsse Horizontal
(1) "F" Baker Special
(1) 3 in. Bsr Lucas—42 in. table
(2) 30 in. Bullard
(1) 37 in. Bridgeport—(1) head
(1) 84 in. Betts. 2 heads
(1) 10 ft. Pond floor boring machine

DRILL PRESSES

(8) Barnes Friction
(4) 1-spindle sensitive
(5) 2-spindle sensitive
(1) 4-spindle Reed sensitive
(1) 6-spindle Quint turret
(3) 20 in. Barnes upright
(1) 24 in. Pratt & Whitney
(2) 24 in. Baker high speed
(4) 25 in. W. F. & J. Barnes
(2) 26 in. Lodge & Davis
(1) 30 in. Prentice Bros. (new)
(1) 33 in. Bement-Miles
(1) 34 in. Barnes—gear feed
(1) 24 in. Fosdick Radial

GEAR CUTTERS

(1) Grant-Lees hobbing machine
(1) 30 in. x 8 in. Brainard spur
(1) 36 in. x 9 in. x5p Gould & Eberhardt
(2) 50 in. x11 in. x3p Gould & Eberhardt

GRINDERS

(2) Cincinnati Cutter & Tool
(1) Pratt & Whitney cutter and surface
(1) No. 2 Brown & Sharpe Universal

LATHES

(1) 10 in. x 4 ft. Davis [ment.
(1) 14 in. 6 ft. Prentice, taper attach-
(1) 14 in. x 6 ft Flather comp. rest
(1) 14 ft. x 6 ft. Hendey, taper attachment
(1) 14 in x 6 ft. Flather, taper attachmen
(1) 14 in. x 6 ft. Whitcomb Blaisdell turret on shears
(2) 14 in. x 6 ft. Le Blond
(1) 14 in. x 8 ft. Flather
(2) 15 in. x 6 ft. Blaisdell
(1) 16 in. x 6 ft. Reed
(2) 16 in x 6 ft. Lodge & Shipley
(2) 16 in. x 6 ft. Pratt & Whitney
(1) 20 in. x 8 ft. Flather
(1) 22 in. x 12 ft. Wolcott, comp. rest
(1) 24 in. x 8 ft. Flather
(1) 24 in. x 10 ft. Lodge & Barker
(1) 26 in. x 12 ft. Reed—chuck fitted
(1) 32 in. x 20 ft. Jackson & Wiley
(1) 62 in. x 20 ft. Gummer
(1) 62 in. x 25 ft. Putnam, motor driven

LATHES—POLISHING

(2) No. 3 Diamond, 52 x 1 1-4 spindle
(2) No. 7G Diamond, 48 x 1 1-4 spindle

MILLING MACHINES

(1) No. 2 Pratt & Whitney—hand
(1) No. 3 Garvin—hand
(1) No. 1 Pratt & Whitney—plain
(1) No. 1 Brainard Universal
(1) No. 15 Becker-Brainard Univ.
(1) No. 2 Brown & Sharpe universal
(1) No. 3 Brown & Sharpe universal
(6) No. 2 Pratt & Whitney Lincoln pattern
(1) No. 40 Becker-Brainard double head
(1) 42 in. x 24 in. x 8 ft. Ingersoll, slab

PLANERS

(1) 20 in. x 20 in. x 4 ft. Wheeler, 1 head
(1) 24 in. x 24 in. x 6 ft. Cincinnati 1 head
(1) 26 in. x 26 in. x 10 ft. Powell, 2 heads
(1) 36 in. x 36 in. x 10 ft. Gray, 1 head, arranged for 2.
(1) 42 in. x 36 in. x 14 ft. Cincinnati, 2 heads
(1) 42 in. x 42 in. x 21 ft. Woodward & Powell, 4 heads

PRESSES

(1) D75 Ferracute
(1) No. 62 Toledo
(1) No. 8 Greenerd arbor

SAWS

(1) 6 in. Cochrane-Bly
(1) 6 in. Newton

SHAPERS

(1) 15 in. Pratt & Whitney tool room
(1) 16 in. Stockbridge, back geared
(1) 20 in. Hendey
(1) 24 in. Gould & Eberhardt
(1) 24 in Hendey
(1) 24 in. Potter & Johnson
(1) 28 in. Hendey

TURRET LATHES

(2) No. 2 Pratt & Whitney wire feed
(2) No. 3 Pratt & Whitney wire feed
(1) No. 4 Bardons & Oliver
(1) No. 5 Warner & Swasey
(2) 2 in. x 24 in. Jones & Lamson
(1) 2 in. x 26 in. Pratt & Whitney
(1) 21 in. Gisholt with taper att.
(1) 22 in. Bullard "H" machine
(2) 22 in. Lodge & Shipley

THE MOTCH & MERRYWEATHER MACHINERY CO.
707-715 Lakeside Ave. N. W., Cleveland, Ohio
Detroit Br'ch: 1025 Majestic Bldg. Cincinnati Br'ch: 1014 1st N't'l B'k Bldg.

SHEARS

22" foot power shear.
20" Lambertville, double end punch and shear.
36" Harrold punch or shear, NEW.
No. 7 Hilles & Jones vertical punch and shear, 16" knife, 18" throat.
Hand power lever shear.
Newbold rotary shear, 53" throat.
Belt driven upright shear, 4½" throat.
Plate beveling shear, 6½" knife.

MISCELLANEOUS

for Steel Works and Rolling Mills

1 stand 3-high 18' closed top housings.
1 stand 2-high 22" bar mill housings.
9' Fry-Scheker dry grinding pan.
5' Wilkes dry pan.
9' 2" x 21½" x 24½" cast iron bosh.
10' x 18" x 30" steel plate bosh.
Corrugating machine for sheets.
Newbold rotary drum squeezer.
United Engineering No. 0 angle straightening machine, engine driven.
Fly wheels and pulleys, all sizes and weights.

Wickes Brothers

117-119 Fourth Ave.
PITTSBURG, - PA.

Frogs & Switches

ALSO

LIGHT RAILS, SPLICE BARS, SPIKES & BOLTS, SWITCHSTANDS, RAIL BRACES, } Quick Shipments of Short Orders. { CAR PUSHERS, DERAILERS, HEAVY CHAIN, PLATES 12' to 36' CUT TO SKETCH.

CENTRAL TRACK SUPPLY COMPANY, Springfield, O.

FOR SALE

1—48" x 21' Putnam Triple Geared Engine Lathe, Used six months.
1—12" Niles Late Improved Slotter, used three months.
1—42" x 42" x 8' Detrick & Harvey Open Side Planer. Used three months.
1—14" x 14" Hall Duplex Belt Driven Compressor, 650 cu. ft. Good condition.
1—10 x 10 x 10 Laidlaw-Dunn-Gordon Compressor. Used six months.
1—40" Betts Vertical Boring Mill. Fine condition.

WM. WARD MACHINERY CO., 801 House Building Pittsburg, Pa.

FOR SALE

All of the machinery of twenty-seven large manufacturing plants including the following:—

Lathes	**Jointers**
Drill Presses	**Moulders**
Boilers	**Surfacers**
Engines	**Tenoners**
Dynamos	**Saw Tables**

Foundry Equipment, etc., etc.

Write for our list. Over seven thousand items must be disposed of at once.

R. C. LUCAS & CO., MARION, OHIO

Bargains in Rebuilt Second-Hand Machinery

LATHES

1171—15" x 6' Sebastian Standard Engine Lathe with compound rest complete.
1172—16" x 6' LeBlond Standard Engine Lathe with compound rest complete, Turret on Carriage and chuck plate fitted.
1169—20" x 10' Gray Standard Engine Lathe with Plain Rest complete.
1359—Niles Single Head Axle Lathe.
1360—31" x 16' Rahn-Carpenter Double Head Lathe complete.

MILLING MACHINES

1349—No. 2 Brown & Sharpe Vertical Milling Machine, complete with set of tools; used less than 30 days.
1593—No. 3 LeBlond Plain Milling Machine with all power feeds.

METAL PLANERS

1366—24" x 24" x 6' Silk Planer, one head, complete with 12" swivel base planer chuck fitted; used less than 30 days.
1657—32"x 32" x 12' Gray Spur Geared Planer, two heads on cross rail complete.
1461—36" x 36" x 14' Niles Planer, one head on cross rail, arranged for parallel drive.

AUTOMATIC GEAR CUTTERS

1646—Brown & Sharpe No. 3—26" Automatic Gear Cutter complete.
1647—Brown & Sharpe No. 3—26" Automatic Gear Cutter complete.

MISCELLANEOUS

1222—32" Cincinnati Heavy Pattern Sliding Head Drill Press complete.
202—Sensitive Drill Press on Column.
1569—Brown & Sharpe Hand Screw Machine for ⅜" stock.
1579—Cleveland ¾" Semi-Automatic Screw Machine complete.
1019—30" Bullard Vertical Turret Boring Mill.
757—No. 4 Hanson & Van Winkle Buffing Machine without stand.
834—No. 8 Diamond Grinder for wheels 30 x 5".
1300—Lea Electric Cutter and Reamer Grinder complete.
1632—U. S. Electric Tool Co.'s Style DA—110 volt D. C. 2-speed Electric Breast Drill, capacity 0 to ½".
1365—Phoenix 5 H. P. 220-volt D. C. Motor, speed 1450 R. P. M.
1091—No. 16 American Gas Oven Furnace.
286—Four Spindle Nut Tapper.
203—Water Tool Grinder.
1642—Whiton 4" 2-spindle Centering Machine complete.
1364—Garvin Bench Cutter and Reamer Grinder.
1617—Atlas 20 H. P. Vertical Boiler, size 36" x 8' 9" complete.
1366—Clayton Single Belt Driven Air Compressor, air cylinder 6" dia., 6" stroke, 29.5 cu. ft. of free air per minute, 100 lb. pressure.

Send for Our Complete List of New and Second-Hand Tools.

THE E. A. KINSEY CO., 331-333-335 W. Fourth St., Cincinnati, O

CLASSIFIED ADVERTISING SERVICE

Advertisements for "Positions Wanted" and "Positions Vacant" inserted at the rate of 50 cents for 50 words or less, additional words 2 cents each. All other advertisements under classified headings 15 cents a line for each insertion.

POSITIONS VACANT.

SALES MANAGER WANTED BY MANufacturer of high grade gasoline engines for farm and general purposes. Must be well educated, of good address and thoroughly experienced in this line of work. None but high grade men will be considered. Business long established and there is a fine opportunity for the proper man. In writing, give age, experience and references. Address Box 393, THE IRON TRADE REVIEW, Cleveland, Ohio.

SALESMAN WANTED. AN EXPERIenced salesman, familiar with pipe, fittings and valves and steam fitters' line in general, can find permanent employment by addressing Box 391, THE IRON TRADE REVIEW, Cleveland, O. We want a man to travel in Ohio, Indiana and Michigan and we want results.

SHOP SUPERINTENDENT WANTED FOR lubricating specialties. A practical experienced man, who has ability to get up new designs, and who can build and assemble what he designs. State experience fully and salary expected. Address Box 392, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT WANTED FOR malleable iron foundry, having a capacity of 3,000 tons castings per year. Must be capable of taking full charge and with a knowledge of all modern methods to produce satisfactory results. State salary expected. Address Box 385, THE IRON TRADE REVIEW, Cleveland, O.

MALLEABLE IRON FOUNDRY FOREman wanted; must be a competent molder and thoroughly familiar with making all kinds of castings. References required. Address the American Malleable Castings Co., Marion, Ohio.

POSITIONS WANTED

ABOUT TO TERMINATE A FIVE-YEAR contract—a foundryman looks up to see who's next. An advance here if I stay and an outside offer or two, but tonnage and variety and progress in methods is my aim. Since 1883 with blast furnaces, cupolas and laboratories. Original applications of chemistry and metallography. Yet young at 47. Investigate my patents and processes. Mine and city wheels beat all records. High priced mixtures eliminated years ago by study and practice. Address Box 51, care PENTON'S LIST, Cleveland, O. p.

SALESMAN, PRACTICAL MAN OF 30, having held the following positions within the past 12 years, with large concerns in the steel, malleable and gray foundry business, is open for an engagement as sales manager, purchasing agent, cost clerk, paymaster, foundry order clerk and salesman, having traveled the past five years from Maine to Kansas City. Address Box 52, PENTON'S LIST, Cleveland, Ohio. p.

SITUATION WANTED BY THOROUGHly experienced accountant possessing executive ability as accountant, auditor, or office manager, with a thoroughly practical knowledge of factory cost accounting. Now closing eight years' service as accountant and office manager for structural steel company; 15 years' experience, age 34, best of references. Address Box 390, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED BY METALLURgist and Chemist, Technical graduate with degree of bachelor of science, six years experience in practical work in charge of laboratories and metallurgical work of large corporation, thoroughly conversant with steel and with foundry practice, both grey and malleable, knowledge of various lines of commercial materials, desire to correspond with concern requiring high class services. Address Metallurgist, care of THE IRON TRADE REVIEW, Cleveland, Ohio.

POSITION WANTED BY CHEMIST. UPto-date experience in malleable, grey iron and brass foundry practice. Also knowledge of metallography, pyrometry, galvanizing, etc. Long experience with present employers. Would consider a proposition in the above lines or from from a steel foundry, railroad, smelter, or mine. Open for engagement immediately. Address G. M. Thrasher, Kewanee, Ill.

POSITION WANTED AS FOUNDRY foreman; 20 years' experience, 3 as foreman; can handle light or heavy work; understand the mixture of iron and brass; can furnish references. Box 50, PENTON'S LIST, Cleveland, O. p

POSITION WANTED. CHEMIST, UNIversity graduate in chemical engineering course with six years' experience in charge of testing laboratories wants position as chemist or assistant superintendent of blast furnace or smelting works, or steel works. Best of references as to ability and character. Address Box 382, THE IRON TRADE REVIEW, Cleveland, O.

BUSINESS OPPORTUNITIES.

PARTY EXPERIENCED IN FOUNDRY work wishes to correspond with owners of idle plant with view of purchase, lease or forming stock company, or would take active and financial interest in concern now operating. Have new method, etc., whereby production is increased and labor decreased in a line of goods for which there is a large field. Give full particulars as possible. Address "Brandon," care THE IRON TRADE REVIEW, Cleveland, O.

CAPITAL OR A GOING BUSINESS wanted to exploit patented improvements on closed hub, self-oiling, mining wheel of most noted record; the joint owners, a mechanical draftsman and an experienced foundryman, with chemical methods, wish to be identified with the manufacture and their interest to be stock and royalty. Address J. H. R., 2008 Forest avenue, Knoxville, Tenn. p.

STRICTLY MODERN GRAY IRON FOUNdry for sale, completely equipped and in daily operation on profitable machinery work. Located in Michigan town with excellent shipping facilities. Best of reasons for selling and will make liberal terms. Full information cheerfully furnished. Address Box 338, THE IRON TRADE REVIEW, Cleveland, O.

A LARGE MILL MACHINERY AND MILL supply house in the southwest desiring to double their capital stock desires correspondence with business men of means, who would care to invest in a business that will insure good returns. Address P. O. Box 87, Dallas, Texas.

WANTED PARTY WITH A FEW THOUsand dollars to join me in exploring iron property on Mesabi iron range. R. B. Higbee, Germania Life Bldg., St. Paul, Minn.

FURNACE FOR SALE.

THREE BLAST FURNACES FOR SALE, one in operation, two more which are in good condition and could be put in operation in 60 to 90 days. Parties wishing to investigate these properties would do well to act promptly in the matter. These properties all have very large supply of good 50 per cent iron ore, that is easily smelted and can be mined cheaply. For particulars address Box 388, THE IRON TRADE REVIEW, Cleveland, O.

ONE NO. 4 CASE HARDENING FURnace for sale, manufactured by the American Gas Furnace Co., of Elizabeth, N. J. The furnace has never been used. Address A. L. Sanger, Purchasing Agent, the C., H. & D. Railway Co., Cincinnati, O.

ONE NO. 2 SCHWARTZ OIL FURNACE for sale, complete with pipe connections, smoke stack, ventilating hood and two extra sets of new linings. Can be bought at a decided bargain if taken at once. Louisiana Contracting Co., St. Louis, Mo.

ENGINE FOR SALE.

FOR SALE—ONE 23 X 60 SINGLE CYLinder, double acting, Harris Corliss, pendulum ball governor, with section cast iron fly wheel, 18 ft. x 38". Good order, requirements changed, electric power being used. Address Almond Mfg. Co., Ashburnham, Mass. p.

ONE HAMILTON CORLISS ENGINE for sale, 125 H. P., good condition. Address Western Iron & Foundry Co., Wichita, Kansas.

WASHERS "SPECIAL SIZES."

In any quantity, metal or fibre. Dies, Stamping and Screw Machine Work. Quadriga Mfg. Co., 18 So. Canal St., Chicago, Ill. p.

FOR SALE—MISCELLANEOUS.

PATENT FOR SALE (RECENT ISSUE) pertaining to machine shop equipment, just coming into general use. Good seller, good profits; reason for selling, have other patent better adapted to our equipment and selling to different class of trade. Patterns and jigs go with patent. Address Titus Machine Works, Marion, O. p.

"TEDDY," THE FAMOUS SCREW FEED flue expander and flue cutter, is the best on earth. Highly recommended and pleasing to all who have tried same. Manufactured by the Fernyak Machine Co., Mansfield, O. Write for full particulars and prices. p.

FOR SALE CHEAP. LATHE-BED PIPE machine, brand new. The Loew Mfg. Co., Cleveland, O.

FOR SALE.—A. B. C. EXHAUST FAN, 35", new, never used. The Bashlin Company, Warren, Pa. p

CASTINGS.

WE DESIRE TO CONCLUDE ONE OR more contracts for large or small gray iron castings. Send us your specifications and let us quote you our best prices. Address Raquette Foundry & Supply Co., Massena, N. Y.

SCRAP WANTED.

TAKE NOTICE. WE ARE ALWAYS IN the market and pay highest prices for all kinds of Scrap Metals, such as Copper, Brass, Zinc drosses, Skimmings, Brass filings, etc. Our terms are Net Cash. Drop a line and we will be pleased to name best prices. F. O. B., your city. H. Kander & Co., Bowling Green, O.

WANTED, MISCELLANEOUS.

WANTED TO PURCHASE TEN SECOND hand tanks, 15 feet in diameter by 20 to 30 feet high. Also two 100 feet steel stacks 50 inches or over in diameter. Address H. G. Hamilton, Youngstown, O.

PROPOSALS

SEALED PROPOSALS IN DUPLICATE will be received at the office of the Light-house Engineer, Wilmington, Del., until 11 o'clock A. M., Feb. 1, 1909, and then opened for furnishing metal work for superstructure of Miah Maul Shoal Light-house, Delaware Bay, N. J., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to the Light-house Engineer, Wilmington, Del., a deposit of $5.00 being required to warrant the return of the plans and specifications.

ARMSTRONG PLANER TOOLS
PATENTED
SAVE TIME,
Emery Wheels and Tool Steel
REPAY COST IN 30 DAYS' USE
Write for Cat.
Armstrong Bros. Tool Co.
The "Tool Holder People"
111 N. Francisco Avenue CHICAGO, U.S.A.

LET US HAVE YOUR SPECIFICATIONS ON SINGLE DUPLEX & ROTATIVE STEAM AND POWER
PUMPS
THE JOHN H. McGOWAN CO. CINCINNATI
SIMPLE COMPOUND & COMPOUND CONDENSING ELEVATOR & WATER WORKS PUMPING ENGINES

Boilers, Engines, Etc.

For Sale at Wrecking Prices!

We have in stock ready for immediate delivery the following items, on which we are prepared to quote extraordinary low prices.

ENGINES

1—28x60 L. H. Hamilton Corliss Engine.
1—24x48 L. H. Atlas Corliss.
1—18x42 L. H. Hamilton Corliss.
1—14x42 L. H. Atlas Corliss.
1—12x30 L. H. Atlas Corliss.
1—15¼x16 R. H. Automatic Buckeye Engine.
1—13x12 Center Crank Automatic New York Safety Engine.

PUMPS

1—16x14x10 Worthington Duplex Steam Pump.
1—14x7x10 Worthington Duplex Steam Pump.
1 No. 15 Morris Centrifugal Sand and Drainage Pump direct connected to vertical 12x10 Engine.
1 No. 15 Belted Morris Centrifugal Pump.
1—200 M. P. Cookston Water Heater.

BOILERS

2—18x14 Butt Strapped Double Riveted Horizontal Boilers.

5—500 H. P. Babcock & Wilcox Water Tube Boilers, 150 lbs. pressure. Used only three years.

1—75 H. P. Internally Fired Boiler with Morrison Corrugated Furnace.

1—125 H. P. Internally Fired Boiler, with Morrison Corrugated Furnace.

Both of the above boilers are triple riveted, butt strapped and good for 125 lbs. steam pressure.

1—13 and 20 x 14 Tandem Ideal Compound Engine direct connected to 100 K. W. General Electric, 125 volt Direct Current Generator, thoroughly overhauled; practically new.

Buy from us and save 20 to 75%.

We have several hundred Car Tanks coming off of railroad tank cars made of ¼ in. steel; heads are 5-16 in. thick, and are equipped with standard dome; 15 in. screwed manhole on top of dome. These range in capacity from 3 to 8,000 gallons each. Each tank is thoroughly tested prior to shipment and made absolutely tight. We consider them as good as new. We have them located at Whiting, Ind., Kansas City, Mo., Lima, Ohio, Cleveland, Ohio, Buffalo, N. Y., and Olean, N. Y. Write for prices.

Catalog No. 682 mailed free on request.

RADIATION, IRON PIPE, BELTING, ETC.!

5,000 feet Steam Radiation in first class condition, price per foot, 13 cts.
50,000,000 feet of Iron Pipe Radiation in sizes from 3-8 in. to 12 in.
Complete stock of Rubber and Leather Belting, Shafting, Hangers and Mill Supplies.
Write for our prices on Lumber, Sash and Mill work for factory construction.
We are making low quotations on Structural Iron and Steel.
We have a large stock of merchandise of every description, and can supply almost every want of the builder, contractor and purchasing agent.
Send us a complete list of what you need for our estimate. We can save you from 30 to 75 per cent. on the entire bill. Write today for our special bargain catalogue 682, illustrating and describing thousands of astonishing bargains in merchandise constantly required about the home, farm, field and factory. Mailed free to all who request a copy.
We also publish an office furniture catalogue, which is a complete reference book and should be in the possession of every one needing office supplies of any kind. Write today telling us that you want this catalogue and they will be mailed you immediately upon receipt of your communication.

CHICAGO HOUSE WRECKING CO., 35th and Iron Sts., Chicago

SAND BLAST MACHINERY

Will do the same work as five men with brushes.
It will give you cleaner, better work.
This machine is simple in construction.
It does its work quickly and correctly.
All parts are accessible.
Descriptive circular tells all about it.

J. W. PAXSON CO.
PHILADELPHIA.

For Sale

Three Northern generators, 200 kilw. each; Direct-connected to Ames engines, 325 H. P. 18x18.

Inland Steel Co.
Chicago, Ill.

FOR SALE—Machinery Bargains

LATHES
19 x 8 Lodge-Barker, comp. rest, solid spindle.
24 x 12 Flather, raised to 30 in. comp. rest, hollow spindle.
26 x 12 Blaisdell, comp. rest, hollow spindle.
60 in. Stevens Pulley Lathe.

PLANERS
32 x 30 x 10 New Haven, Single Head.
40 x 40 x 11 Aldrich & Calvert, single head.

SHAPER
20" Lodge, Davis & Co., Geared.

MILLER
Duplex Brass Miller.

ENGINES
Corliss, Automatic, and Throttling, all sizes.

BOILERS
Tubular, Fire Box and Vertical, all sizes.

MISCELLANEOUS
Pumps, Heaters, Tanks, Wagon Scales, Saw Mill Machinery, etc.

We are sole manufacturers of the celebrated "Leader" Injectors and Ejectors.

THE RANDLE MACHINERY CO.
1747 Powers St., Cincinnati, Ohio

ANGLE IRON

6 tons ⅝" x ⅝" x ⅛" New Angle Iron. Bargain at $35.00 per ton, f. o. b. New Orleans, La.

ELECTRIC MFG. COMPANY
New Orleans, La.

B. Nicoll & Co.
922-923 First National Bank Building,
Chicago, Ill.
Dealers in
Iron and Steel Scrap.
Pig Iron, Coal and Coke.

FOR SALE

One 3-ton, 3-motor, 220 volt, D. C. cage controlled Electric Traveling Crane, 47 feet 9¾ inches span. Apply

A. WEISKITTEL & SON CO.
Balto., Md., U. S. A. P

Grey Iron Foundry
Fully Equipped and in Operation

For sale, Lease, or will consolidate with a responsible concern that are large users of gray iron castings. Daily capacity of foundry 50 to 100 tons. Located on several railroads in Chicago district. Ten acres of land. Will make a first-class plant for car repair or machinery shops. Will make liberal terms to a first-class, responsible concern which wants to buy or lease. Will take stock with a reputable manufacturing company that wants to consolidate and might subscribe if necessary for additional capital.

Address **E. F. KENNEDY,**
537 Rookery, Chicago, Ill.

A. G. HATHAWAY & CO.
THE FENESTRA
Steel Sash
Cheap as Wood
Fire Proof
CLEVELAND OHIO

WANTED

SECOND HAND LADLE, 15 to 25 tons. Give Prices.

Address Box 386.
THE IRON TRADE REVIEW,
Cleveland, Ohio

WASHINGTON Connellsville Coke

LOW SULPHUR HARD STRUCTURE

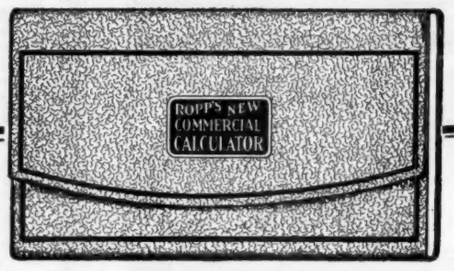
Manufacturers of

FOUNDRY COKE. Highest grade
CRUSHED COKE. Four sizes
STOCK COKE. For heating
1000 Ovens.

WASHINGTON COAL & COKE CO.
Sales Office 7 Wood St.
Pittsburgh, Pa.

Iron Trade Review Index, December 24, 1908.

American Nut & Bolt Fastener Co., Annual Meeting of Stockholders of..... 1047
American Society of Mechanical Engineers, Program of Next Monthly Meeting of..... 1047
Ampere, Andre Marie, Tablet Dedicated to..... 1053
Brakes, Electrically-Operated, for Industrial Purposes..... 1060
Canadian Iron and Steel Plants, Information on in Supplement to American Iron and Steel Association's Directory of Iron and Steel Works..... 1050
Carnegie, Andrew, Testimony of on Tariff Protection Before the Ways and Means Committee of Congress..... 1049
Dust Catcher and Gas Washer, Combined, (John Ruddiman)..... 1066
EDITORIAL:
Andrew Carnegie, Retired..... 1046
Steel Works, Machinery in the..... 1046
Engineers' Society of Western Pennsylvania Members Inspect Great Engine at Duquesne..... 1049
Financial Review..... 1069
Gary, Judge E. H., Testimony of on Tariff Before the Ways and Means Committee of Congress..... 1035
Grab Bucket, New, (Pearless Engineering Co)..... 1058
Imperial Steel Works of Japanese Government in Full Operation..... 1054
Indiana Rolling Mill Co. Combines its Shovel Factory and Rolling Mill,... 1054
Industrial Summary..... 1070
Iron Molders' Union of North American and Stove Founders' National Defense Association, Conference Between Representatives of..... 1045
Lozier Motor Co. Erects New Plant... 1050
Machinery Markets..... 1051
Market Reports..... 1036
National Association of Cement Users, Fifth Annual Convention of..... 1050
National Association of Structural Steel Fabricators Organized..... 1045
National Steel & Wire Co., Receiver Appointed for..... 1049
Obituary; Dr. Thomas Gray; E. S. Johnston; John J. Simmons..... 1050
Ore Handling Machinery, Modern—III, by Walter G. Stephan..... 1055
Pacific Northwest Society of Engineers, Monthly Meeting of..... 1054
Shear, New, (Thomas Carlin's Sons Co.)..... 1068
Spargo Wire Cloth Co., Incorporated. 1068
Speed Counter, New, (Veeder Mfg. Co.)..... 1059
"The Modern Systems Correspondence School Co." Organized..... 1045
Thread Rolling Machine, Heavy, (National Machinery Co.)..... 1068
Westinghouse Machine Co., Annual Election of Officers of..... 1045



ROPP'S NEW CALCULATOR

And Short Cut Arithmetic

Sustains the same relation to the BUSINESS WORLD as Webster's Dictionary to the LITERARY WORLD.
If you do any "figgering" here's something you can't let go. YOU NEED IT. It's a calculator that positively calculates, in the wink of an eye too. IT'S THE THING.
Here are a FEW of the time-saving features:—

Trade Discount Tables.
Discounted at 207 different Rates and Discounts– from 1-16 of 1% to 90 and 40% off.

The Percentage Tables.
Show the equivalent of several successive discounts, etc., etc

The Interest Tables.
Show at a glance the exact interest on **any** sum, at **all** rates for years, months and days, computed on both the **360** and **365** day bases.

The Short-Cut Arithmetic.
Contains all the rules and principles of higher arithmetic, concisely and clearly stated, illustrated by practical examples.

Commercial Law in Brief.
Explains over 70 points of law, with reference to commercial transactions.
Can you afford to miss it?

Place one on Your Desk.
195 pages, 50 illustrations. Postpaid $1.00.

BOOK DEPARTMENT
THE PENTON PUBLISHING CO.
CLEVELAND.

MR. BUYER:---Don't Forget

that each issue of THE IRON TRADE REVIEW contains AN UP-TO-DATE DIRECTORY of the leading manufacturers of and dealers in all kinds of Iron and Steel Products, Castings, Foundry Supplies and Equipment, Machine Tools, Hoisting and Conveying Equipment, and Sundry other products for the Iron and Steel, Machinery, Metalworking and Foundry Trades. It is compiled for your express convenience. The Buyers' Directory in this issue begins on page 80. :: :: :: ::

THE IRON TRADE REVIEW

DROP FORGINGS

MORE THAN FORTY OF THE GREAT AUTOMOBILE MAKERS USE OUR
HIGH CARBON AND NICKEL CRANK SHAFTS
GEAR BLANKS MADE OF SPECIAL STEEL FOR HIGH SPEED DUTY
OUR OWN LABORATORY FOR CHEMICAL AND PHYSICAL TESTS

THE WYMAN & GORDON CO.
WORCESTER CLEVELAND

BETHLEHEM
SPECIAL
HIGH SPEED TOOL STEEL

Has superior qualities

Its High Efficiency develops High Earning Power

No Better Shop Investment

Can one of our Experts call? It may be of Mutual Advantage

BETHLEHEM STEEL COMPANY
South Bethlehem, Pennsylvania

BRANCH OFFICES:

Philadelphia, Pennsylvania Building; New York, No. 100 Broadway; Boston, 165-7 High Street; Pittsburg, Keystone National Bank Building; Cleveland, 1264-68 Ontario St.; Chicago, Fisher Building; St. Louis, 1015-16 Chemical Building; Kansas City, L. H. Atkinson, 315 Massachusetts Bldg.; San Francisco, Flood Building.

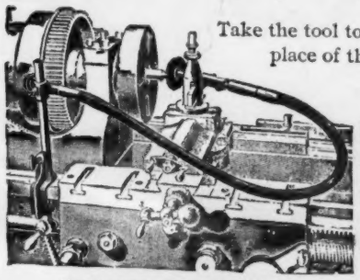
Western Ave. Viaduct, Chicago, Penna. Lines West.

RITER-CONLEY MFG. CO.

PITTSBURGH

Plate and Structural Work of Every Description Complete Plants

Stow Flexible Shaft



Take the tool to the work in place of the work to the tool.

For Drilling, Tapping, Reaming and Grinding on large work it is a great money saver.

THE STOW MFG. CO.
Established 1875 Binghamton, N. Y.
Gen'l European Agts
Selig, Sonnenthal & Co., Queen Victoria St., London, Eng.

Mine, Furnace and Rolling Mill Cars a Specialty.

Core Oven, Foundry Charging and Industrial Railroad Cars adapted to every need.

THE ATLAS CAR & MFG. CO.
Cleveland, Ohio.

We build Cars of all kinds

Roughing Box Tool

FOR TURRET LATHES

Designed especially for rapid commercial work
Correct sizes more easily maintained than with Hollow Mill

Takes a shearing cut on the top of the bar
Quick and accurate adjustment of the cutter by means of the threaded steel collar

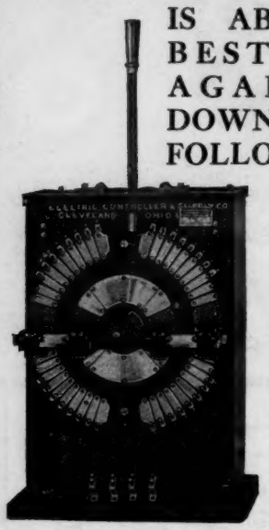
Also FINISHING BOX TOOLS, DIE HOLDERS, DRILL HOLDERS, TAP HOLDERS, etc.

MANUFACTURED BY

BARDONS & OLIVER, Cleveland, Ohio

DINKEY CONTROL

IS ABSOLUTELY THE BEST INSURANCE AGAINST BREAK-DOWNS. NOTE THE FOLLOWING REASONS:



¶ The Dinkey Ventilated Controller is built to ably withstand severe overloads.

¶ Its rugged construction fits it for the severe service and abuse incident to Steel Mill duty.

¶ All parts are interchangeable and easy of access.

¶ Top or bottom lever, self-contained or separate resistance, coil or cast grid, in either case, and will operate either series or shunt brake without additional parts.

OTHER STRONG FEATURES IN BULLETIN No. 99. Send for it.

THE ELECTRIC CONTROLLER & MFG. CO.
CLEVELAND, O.

SCOTT'S CRUCIBLE TOOL STEELS

are most economical for the small as well as the large shop. These steels are made in all grades suitable for any kind of tool from a cold chisel to a high speed drill. Our guarantee goes with every bar. All we ask is a trial order.

Shipment made from stock or mill. See our Monthly Stock List.

THE BOURNE-FULLER CO.
IRON STEEL
PIG IRON
COKE

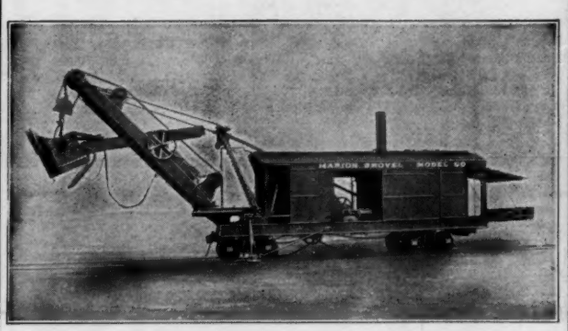
Cleveland, Ohio.

Pittsburgh Office, 1126 Frick Bldg.

STEAM SHOVELS

In all Sizes,
Either Railway or Traction Trucks

Ballast Unloaders, Dipper Dredges and Placer Elevator Dredges



Write for information and prices

THE MARION STEAM SHOVEL CO.

640 West Center Street, Marion, O.

G. W. BARNHART, Western Manager, 718 Monadnock Bldg. San Francisco, Cal.
F. H. HOPKINS & CO., Representatives, Montreal, Quebec.